

MISSION NDA MATHEMATICS

COMPLETE TOPICWISE QUESTIONS

PARABOLA

- The parabola $y = x^2 - 8x + 15$ cuts the x -axis at P and Q . A circle is drawn through P and Q so that the origin is outside it. The length of a tangent of the circle from O is
(a) 15 (b) $\sqrt{8}$
(c) $\sqrt{15}$ (d) 8
- The tangents at the points $(at_1^2, 2at_1)$ and $(at_2^2, 2at_2)$ on the parabola $y^2 = 4ax$ are at right angles if
(a) $t_1 t_2 = -1$ (b) $t_1 t_2 = 1$
(c) $t_1 t_2 = 1$ (d) $t_1 t_2 = -2$
- If y_1 and y_2 are the ordinates of two points P and Q on the parabola and y_3 is the ordinate of the points of intersection of tangents at P and Q , then
(a) y_1, y_2, y_3 are in A.P. (b) y_1, y_3, y_2 are in A.P.
(c) y_1, y_2, y_3 are in G.P. (d) y_1, y_3, y_2 are in G.P.
- A tangent to a parabola $y^2 = 4ax$ is inclined at $\pi/3$ with the axis of the parabola. The point of contact is
(a) $\left(\frac{a}{3}, -\frac{2a}{\sqrt{3}}\right)$ (b) $(3a, -2\sqrt{3}a)$
(c) $(3a, 2\sqrt{3}a)$ (d) none of these
- At any point P on the parabola $y^2 - 2y - 4x + 5 = 0$, a tangent is drawn which meets the directrix at Q . The locus of the points P which divides QP externally in the ratio $\frac{1}{2}:1$, is
(a) $(x+1)(1-y^2) + 4 = 0$ (b) $x+1 = 0$
(c) $(1-y)^2 - 4 = 0$ (d) none of these
- The point on $y^2 = 4ax$ nearest to the focus has its abscissae equal to
(a) $-a$ (b) a
(c) $a/2$ (d) 0
- The tangents and normals at the ends of the latus rectum of a parabola form
(a) a cyclic quadrilateral (b) a rectangle
(c) a square (d) none of these
- Find the lengths of the normals drawn from the point on the axis of the parabola $y^2 = 8x$ whose distance from the focus is 8.
(a) 10 (b) 8
(c) 9 (d) none of these
- If t is the parameter for one end of a focal chord of the parabola $y^2 = 4ax$, then its length is



- (a) $a\left(t + \frac{1}{t}\right)^2$ (b) $a\left(t - \frac{1}{t}\right)^2$
 (c) $a\left(t + \frac{1}{t}\right)$ (d) $a\left(t - \frac{1}{t}\right)$
10. The vertex of the parabola $(y - 2)^2 = 16(x - 1)$ is
 (a) (2,1) (b) (1, -2)
 (c) (-1,2) (d) (1,2)
11. A ray of light moving parallel to the x -axis gets reflected from a parabolic mirror whose equation is $(y - 2)^2 = 4(x + 1)$. After reflection, the ray must pass through the point
 (a) (2,0) (b) (0, -2)
 (c) (0,2) (d) (-1, -2)
12. If two distinct chords of a parabola $y^2 = 4ax$ passing through $(a, 2a)$ are bisected on the line $x + y = 1$, then the length of the latus rectum can be
 (a) 6 (b) -4
 (c) 4 (d) none of these
13. The curve described parametrically by $x = t^2 + t + 1$ and $y = t^2 - t + 1$ represents
 (a) a pair of lines (b) an ellipse
 (c) a parabola (d) a hyperbola
14. The equation of the chord of the parabola $y^2 = 8x$ which is bisected at the point $(2, -3)$ is
 (a) $4x + 3y + 1 = 0$ (b) $3x + 4y - 1 = 0$
 (c) $4x - 3y - 1 = 0$ (d) $3x - 4y + 1 = 0$
15. The coordinates of the focus of the parabola $x^2 = 6y$ is
 (a) (0,0) (b) (3,0)
 (c) $\left(0, \frac{3}{2}\right)$ (d) (0,5)
16. The locus of the foot of the perpendicular from the focus upon a tangent to the parabola $y^2 = 4ax$ is
 (a) the directrix (b) tangents at the vertex
 (c) $x = a$ (d) none of these
17. If the circle $x^2 + y^2 + 2\lambda x = 0, \lambda \in \mathbb{R}$, touches the parabola $y^2 = 4x$ externally, then
 (a) $\lambda > 0$ (b) $\lambda < 0$
 (c) $\lambda > 1$ (d) none of these
18. The normal chord at a point t on the parabola $y^2 = 4ax$ subtends a right angle at the vertex. Then $t^2 =$
 (a) 4 (b) 2
 (c) 1 (d) 3
19. If points $(au^2, 2au)$ and $(av^2, 2av)$ are extremities of the focal chord of a parabola $y^2 = 4ax$, then
 (a) $u + v = 0$ (b) $u - v = 0$
 (c) $uv - 1 = 0$ (d) $uv + 1 = 0$
20. An equilateral triangle is inscribed in the parabola $y^2 = 4x$ one of whose vertex is at the vertex of the parabola. The length of each side of the triangle is

- (a) $8\sqrt{3}$ (b) $\frac{\sqrt{3}}{2}$
 (c) $\frac{4\sqrt{3}}{2}$ (d) $\frac{8\sqrt{3}}{2}$
21. If $x + y = k$ is normal to $y^2 = 12x$, then k is
 (a) 3 (b) 9
 (c) -9 (d) -3
22. If the chord of contact of tangents from a point P to the parabola $y^2 = 4ax$ touches the parabola $x^2 = 4by$, then the locus of P is
 (a) a circle (b) a parabola
 (c) a straight line (d) none of these
23. The equation of the x -axis of the parabola $2x^2 + 5y - 3x + 4 = 0$ is
 (a) $x = \frac{3}{4}$ (b) $y = \frac{3}{4}$
 (c) $x = -\frac{1}{2}$ (d) $x - 3y = 5$
24. If the tangent and normal at the extremities of a focal chord of a parabola intersect at (x_1, y_1) and (x_2, y_2) , respectively, then
 (a) $x_1 = x_2$ (b) $x_1 = y_2$
 (c) $y_1 = y_2$ (d) $x_2 = y_1$
25. The length of the latus rectum of the parabola $9x^2 - 6x + 36y + 19 = 0$ is
 (a) 4 (b) 6
 (c) 9 (d) 36
26. AB and AC are tangents to a parabola $y^2 = 4ax$. If l_1, l_2 and l_3 are the lengths of perpendiculars from A, B, C on any tangent to the parabola, then
 (a) l_1, l_2, l_3 are in G.P. (b) l_2, l_1, l_3 are in G.P.
 (c) l_3, l_1, l_2 are in G.P. (d) l_3, l_2, l_1 are in G.P.
27. The equation of the parabola, whose vertex is $(1, -2)$ and focus $(1, -1)$, is
 (a) $x^2 = 4(y + 2)$ (b) $(x - 1)^2 = 4(y + 2)$
 (c) $(x + 1)^2 = 4(y - 2)$ (d) $(x + 1)^2 = 4(y + 2)$
28. If $y + 3 = m_1(x + 2)$ and $y + 3 = m_2(x + 2)$ are two tangents to the parabola $y^2 = 8x$, then
 (a) $m_1 + m_2 = 0$ (b) $m_1 m_2 = -1$
 (c) $m_1 m_2 = 1$ (d) none of these
29. The equation of the parabola with its axis on the y -axis and passing through the origin and point $(6, -3)$ is
 (a) $x^2 = 12y$ (b) $x^2 = -12y$
 (c) $y^2 = 12x + 6$ (d) $x^2 = -12x + 6$
30. If the common normal to the parabolas $y^2 = 4ax$ and $y^2 = 4c(x - b)$ is not horizontal, i.e. not parallel to x -axis, then
 (a) $\frac{b}{a-c} > 2$ (b) $\frac{c}{b-a} > 2$
 (c) $\frac{a}{c-b} > 2$ (d) none of these

Assertion-Reason Type Questions



The following questions are 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 the correct choice given as follows:

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

31. Statement I: Length of latus rectum of parabola $(3x - 7y + 4)^2 = 6(7x - 9y + 2)$ is 6 .
Statement II: Length of latus rectum of parabola $y^2 = 4ax$ is $4a$.
32. Statement I: If the normals at the end points of a double ordinate at $x = 4$ of the parabola $y^2 = 4x$ meet the curve again at P and P' , then $PP' = 12$ units.
Statement II: If the normal at t_1 of $y^2 = 4ax$ meets the parabola again at t_2 then $t_2 = t_1 - \frac{2}{t_1}$.
33. Statement I: If PQ and P_1Q_1 are two focal chords of the parabola $y^2 = 4ax$, then the locus of the point of intersection of chords PP_1 and QQ_1 is the directrix of the parabola.
Statement II: The locus of the point of intersection of perpendicular tangents of parabola is the directrix of the parabola.
34. Statement I: If the vertex of the parabola is at the point $(a, 0)$ and the directrix is the y -axis then the focus of the parabola is at the point $(2a, 0)$.
Statement II: Length of common chord of the parabola $y^2 = 12x$ and the circle $x^2 + y^2 = 9$ is equal to the length of latus rectum of the parabola.

Previous Years' Questions

35. If the normal at the point $(bt_1^2, 2bt_1)$ on a parabola $y^2 = 4bv$ meets the parabola again at the point $(bt_2^2, 2bt_2)$, then
- (a) $t_2 = -t_1 - \frac{2}{t_1}$
 - (b) $t_2 = -t_1 + \frac{2}{t_1}$
 - (c) $t_2 = t_1 - \frac{2}{t_1}$
 - (d) $t_2 = t_1 + \frac{2}{t_1}$
36. If $a \neq 0$ and the line $2bx + 3cy + 4d = 0$ passes through the points of intersection of the parabolas $y^2 = 4ax$ and $x^2 = 4ay$, then
- (a) $d^2 + (2b + 3c)^2 = 0$
 - (b) $d^2 + (3b + 2c)^2 = 0$
 - (c) $d^2 + (2b - 3c)^2 = 0$
 - (d) $d^2 + (3b - 2c)^2 = 0$
37. Let P be a point $(1,0)$ and Q be a point on the locus of $y^2 = 8x$. The locus of the mid-point of PQ is
- (a) $x^2 - 4y + 2 = 0$
 - (b) $x^2 + 4y + 2 = 0$



(c) $y^2 + 4x + 2 = 0$

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

38. The locus of the vertices of the family of parabolas $y = \frac{a^3 x^2}{3} + \frac{a^2 x}{2} - 2a$ is

(a) $xy = \frac{64}{105}$

(b) $xy = \frac{105}{64}$

(c) $xy = \frac{3}{4}$

(d) $xy = \frac{35}{16}$

39. Statement I: The curve $y = -\frac{x^2}{2} + x + 1$ is symmetric with respect to the line $x = 1$.

Statement II: A parabola is symmetric about its axis.

(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.

40. The equation of the tangent to the parabola $y^2 = 8x$ is $y = x + 2$. The point on this line from which the other tangent to the parabola is perpendicular to the given tangent is

(a) (0,2)

(b) (2,4)

(c) (-2,0)

(d) (-1,1)

41. A parabola has the origin as its focus and the line $x = 2$ as the directrix. Then the vertex of the parabola is at

(a) (2,0)

(b) (0,2)

(c) (1,0)

(d) (0,1)

42. If two tangents drawn from a point P to the parabola $y^2 = 4x$ are at right angles, then the locus of P is

(a) $x = 1$

(b) $2x + 1 = 0$

(c) $x = -1$

(d) $2x - 1 = 0$

43. If a focal chord of the parabola $y^2 = ax$ is $2x - y - 8 = 0$, then the equation of the directrix is

(a) $x + 4 = 0$

(b) $x - 4 = 0$

(c) $y - 4 = 0$

(d) $y + 4 = 0$

44. The equation of the parabola with vertex at the origin and directrix $y = 2$ is

(a) $y^2 = 8x$

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

(c) $y^2 = \sqrt{8}x$

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

45. The point of the parabola $y^2 = 18x$, for which the ordinate is three times the abscissa, is

(a) (6,2)

(b) (-2, -6)

(c) (3,18)

(d) (2,6)

46. The equation of the directrix of the parabola $x^2 + 8y - 2x = 7$ is
 (a) $y = 3$ (b) $y = -3$
 (c) $y = 2$ (d) $y = 0$
47. If $x^2 + 6x + 20y - 51 = 0$, then the axis of parabola is
 (a) $x + 3 = 0$ (b) $x - 3 = 0$
 (c) $x = 1$ (d) $x + 1 = 0$
48. The equation of the parabola which passes through the intersection of a straight line $x + y = 0$ and the circle $x^2 + y^2 + 4y = 0$ is
 (a) $y^2 = 4x$ (b) $y^2 = x$
 (c) $y^2 = 2x$ (d) none of these
49. Let a focal chord of parabola $y^2 = 16x$ cuts it at points (f, g) and (h, k) . Then, $f \cdot h$ is equal to
 (a) 12 (b) 16
 (c) 14 (d) none of these
50. Three normals to the parabola $y^2 = x$ pass through the point $(a, 0)$. Then
 (a) $a = \frac{1}{2}$ (b) $a = \frac{1}{4}$
 (c) $a > \frac{1}{2}$ (d) $a < \frac{1}{2}$
51. The locus of the middle points of the chords of the parabola $y^2 = 4ax$, which passes through the origin, is
 (a) $y^2 = ax$ (b) $y^2 = 2ax$
 (c) $y^2 = 4ax$ (d) $x^2 = 4ay$
52. The point of intersection of tangents at the ends of the latus rectum of the parabola $y^2 = 4x$ is equal to
 (a) (1,0) (b) (-1,0)
 (c) (0,1) (d) (0,-1)
53. The equation of the parabola with focus (0,0) and directrix $x + y + 4$ is
 (a) $x^2 + y^2 - 2xy + 8x + 8y - 16 = 0$
 (b) $x^2 + y^2 - 2xy + 8x + 8y = 0$
 (c) $x^2 + y^2 + 8x + 8y - 16 = 0$
 (d) $x^2 - y^2 + 8x + 8y - 16 = 0$
54. The equation of the line which is tangent to both the circle $x^2 + y^2 = 5$ and the parabola $y^2 = 40x$ is
 (a) $2x - y + 5 = 0$ (b) $2x - y + 5 = 0$
 (c) $2x - y - 5 = 0$ (d) $2x + y + 5 = 0$
55. AB is a chord of the parabola $y^2 = 4ax$ with vertex at A . BC is drawn perpendicular to AB meeting the axes at C . The projection of BC on the axis of the parabola is



- (a) 2
(c) $4a$
- (b) $2a$
(d) $8a$
56. The common tangent of the parabolas $y^2 = 4x$ and $x^2 = -8y$ is
(a) $y = x + 2$
(b) $y = x - 2$
(c) $y = 2x + 3$
(d) none of these
57. If l denotes the semi-latus rectum of the parabola $y^2 = 4ax$ and SP and SQ denote the segments of any focal chord PQS being the focus, then SP, l and SQ are in the relation
(a) A.P.
(b) G.P.
(c) H.P.
(d) $l^2 = SP^2 + SQ^2$
58. The focal chord of $y^2 = 16x$ is tangent to $(x - 6)^2 + y^2 = 2$. Then the possible values of the slope of this chord are
(a) $1, -1$
(b) $-\frac{1}{2}, 2$
(c) $-2, \frac{1}{2}$
(d) $\frac{1}{2}, 1$
59. The locus of the mid-point of the line segment joining the focus to a moving point on the parabola $y^2 = 4ax$ is another parabola with directrix
(a) $x = -a$
(b) $x = -\frac{a}{2}$
(c) $x = 0$
(d) $x = \frac{a}{2}$
60. The angle between the tangents drawn from the point $(1, 4)$ to the parabola $y^2 = 4x$ is
(a) $\pi/6$
(b) $\pi/4$
(c) $\pi/3$
(d) $\pi/2$
61. A tangent is drawn to the parabola $y = x^2 + 6$ at the point $(1, 7)$ which also touches the circle $x^2 + y^2 + 16x + 12y + c = 0$ at
(a) $(-8, -6)$
(b) $(-7, -6)$
(c) $(-6, -7)$
(d) $(6, 7)$
62. The axis of a parabola is along the line $y = x$ and the distance of its vertex from the origin is $\sqrt{2}$ and that from its focus is $2\sqrt{2}$. If the vertex and focus both lie in the first quadrant, then the equation of the parabola is
(a) $(x + y)^2 = (x - y - 2)$
(b) $(x - y)^2 = (x + y - 2)$
(c) $(x - y)^2 = 4(x + y - 2)$
(d) $(x - y)^2 = 8(x + y - 2)$
63. The equation of the common tangents to the parabola $y = x^2$ and $y = -(x - 2)^2$ is
(a) $y = 4(x - 1)$
(b) $y = 0$
(c) $y = -4(x - 1)$
(d) $y = -30x - 50$

64. The focus of the parabola $y^2 - x - 2y + 2 = 0$ is

(a) $(\frac{1}{4}, 0)$

(b) $(1, 2)$

(c) $(\frac{5}{4}, 1)$

(d) $(\frac{3}{4}, \frac{5}{2})$

65. If the tangent at extremities of a focal chord AB of the parabola $y^2 = 4ax$ intersects at a point C , then $\angle ACB$ is equal to

(a) $\pi/4$

(b) $\pi/3$

(c) $\pi/2$

(d) $\pi/6$

ANSWERS

1. (c)	2. (a)	3. (a)	4. (a)	5.	6.	(d)	7.	(c)	8.	(b)	9.	10.
11.	12.	13. (c)	14. (a)	15.	16.	(b)	17.	(a)	18.	(b)	19.	20.
21.	22.	23. (a)	24. (c)	25.	26.	(b)	27.	(b)	28.	(b)	29.	30.
31.	32.	33.	34.	(d)	35.	36.	(a)	37.	(d)	38.	(b)	39.
40.	41.	42.	43.	44.	(d)	45.	46.	(a)	47.	(a)	48.	(c)
49.	52.	53.	54.	(b) and (c)	55.	(c)	56.	(d)	57.	(c)	58.	59.
60.	61.	62.	63.	(a)	and (b)	64.	(c)	65.	(c)			

