1. If on a given base, a triangle be described such that the sum of the tangents of the base angles is a constant, then the locus of the vertex is :

(A) a circle (B) a parabola (C) an ellipse (D) a hyperbola

2. The locus of the point of trisection of all the double ordinates of the parabola $y^2 = \ell x$ is a parabola whose latus rectum is -

(A) $\frac{\ell}{9}$ (B) $\frac{2\ell}{9}$ (C) $\frac{4\ell}{9}$ (D) $\frac{\ell}{36}$

3. A variable circle is drawn to touch the line $3x - 4y = 10$ and also the circle $x^2 + y^2 = 1$ externally then the locus of its centre is -

(A) straight line (B) circle

(C) pair of real, distinct straight lines (D) parabola

4. The vertex A of the parabola $y^2 = 4ax$ is joined to any point P on it and PQ is drawn at right angles to AP to meet the axis in Q. Projection of PQ on the axis is equal to

(A) twice the length of latus rectum (B) the latus length of rectum

(C) half the length of latus rectum (D) one fourth of the length of latus rectum

5. Two unequal parabolas have the same common axis which is the x-axis and have the same vertex which is the origin with their concavities in opposite direction. If a variable line parallel to the common axis meet the parabolas in P and P' the locus of the middle point of PP' is

(A) a parabola (B) a circle (C) an ellipse (D) a hyperbola

6. The straight line $y = m(x - a)$ will meet the parabola $y^2 = 4ax$ in two distinct real points if

(A) $m \in R$ (B) $m \in [-1, 1]$

(C) $m \in (-\infty, 1] \cup [1, \infty)$ (D) $m \in R - \{0\}$

7. The equation of the circle drawn with the focus of the parabola $(x - 1)^2 - 8y = 0$ as its centre and touching the parabola at its vertex is :

(A) $x^2 + y^2 - 4y = 0$ (B) $x^2 + y^2 - 4y + 1 = 0$

(C) $x^2 + y^2 - 2x - 4y = 0$ (D) $x^2 + y^2 - 2x - 4y + 1 = 0$

8. Which one of the following equations represented parametrically, represents equation to a parabolic profile?

(A) $x = 3\cos t$; $y = 4\sin t$ (B) $x^2 - 2 = -2\cos t$; $y = 4\cos^2\frac{t}{2}$

(C) $\sqrt{x} = \tan t$; $\sqrt{y} = \sec t$ (D) $x = \sqrt{1 - \sin t}$; $y = \sin\frac{t}{2} + \cos\frac{t}{2}$

9. The length of the intercept on y – axis cut off by the parabola, $y^2 - 5y = 3x - 6$ is

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

10. If the line $x - 1 = 0$ is the directrix of the parabola $y^2 - kx + 8 = 0$ then one of the values of 'k' is -

(A) 1/8 (B) 8 (C) 4 (D) 1/4

11. Angle between the parabolas $y^2 = 4(x-1)$ and $x^2 + 4(y-3) = 0$ at the common end of their latus rectum, is -

(A) $\tan^{-1}(1)$ (B) $\tan^{-1}1 + \cot^{-1}2 + \cot^{-1}3$

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

12. Length of the latus rectum of the parabola $25[(x-2)^2 + (y-3)^2] = (3x - 4y + 7)^2$ is-

(A) 4 (B) 2 (C) 1/5 (D) 2/5

13. If a focal chord of $y^2 = 4x$ makes an angle $\alpha, \alpha \in \left(0, \frac{\pi}{4}\right]$ with the positive direction of x-axis, then minimum length of this focal chord is -

(A) $2\sqrt{2}$ (B) $4\sqrt{2}$ (C) 8 (D) 16

14. A parabola $y = ax^2 + bx + c$ crosses the x-axis at $(\alpha,0)$ $(\beta,0)$ both to the right of the origin. A circle also passess through these two points. The length of a tangent from the origin to the circle is :

(A) $\sqrt{\frac{bc}{a}}$ (B) ac^2 (C) $\frac{b}{a}$ (D) $\sqrt{\frac{c}{a}}$

15. If (2,–8) is one end of a focal chord of the parabola $y^2 = 32x$, then the other end of the focal chord, is-

(A) (32,32) (B) (32,–32) (C) (–2,8) (D) (2,8)

16. From an external point P, pair of tangent lines are drawn to the parabola, $y^2 = 4x$. If θ_1 & θ_2 are the inclinations of these tangents with the axis of x such that, $\theta_1 + \theta_2 = \frac{\pi}{4}$, then the locus of P is :

(A) $x - y + 1 = 0$ (B) $x + y - 1 = 0$ (C) $x - y - 1 = 0$ (D) $x + y + 1 = 0$

17. Maximum number of common chords of a parabola and a circle can be equal to

(A) 2 (B) 4 (C) 6 (D) 8

18. PN is an ordinate of the parabola $y^2 = 4ax$ (P on $y^2 = 4ax$ and N on x-axis). A straight line is drawn parallel to the axis to bisect NP and meets the curve in Q. NQ meets the tangent at the vertex in a point T such that AT = kNP, then the value of k is (where A is the vertex)

(A) 3/2 (B) 2/3 (C) 1 (D) none

19. Let A and B be two points on a parabola $y^2 = x$ with vertex V such that VA is perpendicular to VB and θ is the angle between the chord VA and the axis of the parabola. The value of $\frac{|VA|}{|VB|}$ is

(A) $\tan\theta$ (B) $\tan^3\theta$ (C) $\cot^2\theta$ (D) $\cot^3\theta$

20. Minimum distance between the curves $y^2 = x - 1$ and $x^2 = y - 1$ is equal to

(A) $\frac{3\sqrt{2}}{4}$ (B) $\frac{5\sqrt{2}}{4}$ (C) $\frac{7\sqrt{2}}{4}$ (D) $\frac{\sqrt{2}}{4}$

21. The length of a focal chord of the parabola $y^2 = 4ax$ at a distance b from the vertex is c, then

(A) $2a^2 = bc$ (B) $a^3 = b^2c$ (C) $ac = b^2$ (D) $b^2c = 4a^3$

22. The straight line joining any point P on the parabola $y^2 = 4ax$ to the vertex and perpendicular from the focus to the tangent at P, intersect at R, then the equation of the locus of R is

(A) $x^2 + 2y^2 - ax = 0$ (B) $2x^2 + y^2 - 2ax = 0$

(C) $2x^2 + 2y^2 - ay = 0$ (D) $2x^2 + y^2 - 2ay = 0$

23. Locus of the feet of the perpendiculars drawn from vertex of the parabola $y^2 = 4ax$ upon all such chords of the parabola which subtend a right angle at the vertex is

(A) $x^2 + y^2 - 4ax = 0$ (B) $x^2 + y^2 - 2ax = 0$ (C) $x^2 + y^2 + 2ax = 0$ (D) $x^2 + y^2 + 4ax = 0$

24. Locus of trisection point of any arbitrary double ordinate of the parabola $x^2 = 4by$, is -

(A) $9x^2 = by$ (B) $3x^2 = 2by$ (C) $9x^2 = 4by$ (D) $9x^2 = 2by$

25. y-intercept of the common tangent to the parabola $y^2 = 32x$ and $x^2 = 108y$ is

(A) – 18 (B) – 12 (C) – 9 (D) – 6

26. The points of contact Q and R of tangent from the point P (2, 3) on the parabola $y^2 = 4x$ are

(A) (9, 6) and (1, 2) (B) (1, 2) and (4, 4) (C) (4, 4) and (9, 6) (D) (9, 6) and $(\frac{1}{4}, 1)$

27. Length of the normal chord of the parabola, $y^2 = 4x$, which makes an angle of $\frac{\pi}{4}$ with the axis of x is:

(A) 8 (B) $8\sqrt{2}$ (C) 4 (D) $4\sqrt{2}$

28. If the lines $(y - b) = m_1(x + a)$ and $(y - b) = m_2(x + a)$ are the tangents to the parabola $y^2 = 4ax$, then

(A) $m_1 + m_2 = 0$ (B) $m_1m_2 = 1$ (C) $m_1m_2 = -1$ (D) $m_1 + m_2 = 1$

29. If the normal to a parabola $y^2 = 4ax$ at P meets the curve again in Q and if PQ and the normal at Q makes angles α and β respectively with the x-axis then $\tan\alpha (\tan\alpha + \tan\beta)$ has the value equal to

(A) 0 (B) – 2 (C) $-\frac{1}{2}$ (D) – 1

30. Suppose that three points on the parabola $y = x^2$ have the property that their normal lines intersect at a common point (a,b). The sum of their x-coordinates is -

(A) 0 (B) $\frac{2b-1}{2}$ (C) $\frac{a}{2}$ (D) a + b

31. The triangle PQR of area 'A' is inscribed in the parabola $y^2 = 4ax$ such that the vertex P lies at the vertex of the parabola and the base QR is a focal chord. The modulus of the difference of the ordinates of the point Q and R is :

(A) $\frac{A}{2a}$ (B) $\frac{A}{a}$ (C) $\frac{2A}{a}$ (D) $\frac{4A}{a}$

32. Equation of the other normal to the parabola $y^2 = 4x$ which passes through the intersection of those at (4,–4) and (9a, –6a) is -

(A) $5x - y + 115 = 0$ (B) $5x + y - 135 = 0$ (C) $5x - y - 115 = 0$ (D) $5x + y + 115 = 0$

33. Through the focus of the parabola $y^2 = 2px (p > 0)$ a line is drawn which intersects the curve at $A(x_1,y_1)$ and $B(x_2,y_2)$. The ratio $\frac{y_1y_2}{x_1x_2}$ equals-

(A) 2 (B) –1 (C) –4 (D) some function of p

34. If $x + y = k$ is normal to $y^2 = 12x$, then 'k' is-

(A) 3 (B) 9 (C) –9 (D) –3

35. The normal chord of a parabola $y^2 = 4ax$ at the point whose ordinate is equal to the abscissa, then angle subtended by normal chord at the focus is :

(A) $\frac{\pi}{4}$ (B) $\tan^{-1}\sqrt{2}$ (C) $\tan^{-1}2$ (D) $\frac{\pi}{2}$

36. TP & TQ are tangents to the parabola, $y^2 = 4ax$ at P & Q. If the chord PQ passes through the fixed point $(-a, b)$ then the locus of T is :

(A) $ay = 2b(x - b)$ (B) $bx = 2a(y - a)$ (C) $by = 2a(x - a)$ (D) $ax = 2b(y - b)$

37. Through the vertex O of the parabola, $y^2 = 4ax$ two chords OP & OQ are drawn and the circles on OP & OQ as diameters intersect in R. If θ_1, θ_2 & ϕ are the angles made with the axis by the tangents at P & Q on the parabola & by OR then the value of, $\cot\theta_1 + \cot\theta_2 =$

(A) $-2\tan\phi$ (B) $-2\tan(\pi - \phi)$ (C) 0 (D) $2\cot\phi$

38. If a normal to a parabola $y^2 = 4ax$ makes an angle ϕ with its axis, then it will cut the curve again at an angle

(A) $\tan^{-1}(2\tan\phi)$ (B) $\tan^{-1}\left(\frac{1}{2}\tan\phi\right)$ (C) $\cot^{-1}\left(\frac{1}{2}\tan\phi\right)$ (D) none

39. Tangents are drawn from the points on the line $x - y + 3 = 0$ to parabola $y^2 = 8x$. Then the variable chords of contact pass through a fixed point whose coordinates are :

(A) (3,2) (B) (2,4) (C) (3,4) (D) (4,1)

40. If two normals to a parabola $y^2 = 4ax$ intersect at right angles then the chord joining their feet pass through a fixed point whose co-ordinates are :

(A) (–2a,0) (B) (a,0) (C) (2a,0) (D) none

41. The equation of a straight line passing through the point (3,6) and cutting the curve $y = \sqrt{x}$ orthogonally is-

(A) $4x + y - 18 = 0$ (B) $x + y - 9 = 0$ (C) $4x - y - 6 = 0$ (D) none

42. The tangent and normal at P(t), for all real positive t, to the parabola $y^2 = 4ax$ meet the axis of the parabola in T and G respectively, then the angle at which the tangent at P to the parabola is inclined to the tangent at P to the circle passing through the points P, T and G is

(A) $\cot^{-1}t$ (B) $\cot^{-1}t^2$ (C) $\tan^{-1}t$ (D) $\tan^{-1}t^2$

43. A circle with radius unity has its centre on the positive y-axis. If this circle touches the parabola $y = 2x^2$ tangentially at the point P and Q then the sum of the ordinates of P and Q, is-

(A) 15/4 (B) 15/8 (C) $2\sqrt{15}$ (D) 5

44. Normal to the parabola $y^2 = 8x$ at the point P (2, 4) meets the parabola again at the point Q. If C is the centre of the circle described on PQ as diameter then the coordinates of the image of the point C in the line y = x are

(A) (– 4, 10) (B) (–3, 8) (C) (4, – 10) (D) (– 3, 10)

45. Consider two curves $C_1 : (y-\sqrt{3})^2 = 4(x-\sqrt{2})$ and $C_2 : x^2 + y^2 = (6+2\sqrt{2})x + 2\sqrt{3}y - 6(1+\sqrt{2})$, then-

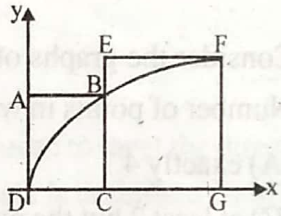
(A) C_1 and C_2 touch each other only at one point.

(B) C_1 and C_2 touch each other exactly at two points.

(C) C_1 and C_2 intersect (but do not touch) at exactly two points.

(D) C_1 and C_2 neither intersect nor touch each other.

46. ABCD and EFGC are squares and the curve $y = k\sqrt{x}$ passes through the origin D and the points B and F. The ratio $\frac{FG}{BC}$ is -



(A) $\frac{\sqrt{5}+1}{2}$ (B) $\frac{\sqrt{3}+1}{2}$

(C) $\frac{\sqrt{5}+1}{4}$ (D) $\frac{\sqrt{3}+1}{4}$

47. C is the centre of the circle with centre (0,1) and radius unity. P is parabola $y = ax^2$. The set of values of 'a' for which they meet at a point other than the origin, is-

(A) $a > 0$ (B) $a \in \left(0, \frac{1}{2}\right)$ (C) $\left(\frac{1}{4}, \frac{1}{2}\right)$ (D) $\left(\frac{1}{2}, \infty\right)$

48. PQ is a normal chord of the parabola $y^2 = 4ax$ at P, A being the vertex of the parabola. Through P a line is drawn parallel to AQ meeting the x-axis in R. Then the length of AR is -

(A) equal to the length of the latus rectum.

(B) equal to the focal distance of the point P.

(C) equal to twice the focal distance of the point P.

(D) equal to the distance of the point P from the directrix.

49. The equation of the common tangent touching the circle $(x-3)^2 + y^2 = 9$ and the parabola $y^2 = 4x$ above the x-axis is -

(A) $\sqrt{3}y = 3x + 1$ (B) $\sqrt{3}y = -(x+3)$ (C) $\sqrt{3}y = x + 3$ (D) $\sqrt{3}y = -(3x+1)$

50. The equation of the directrix of the parabola, $y^2 + 4y + 4x + 2 = 0$ is -

(A) $x = -1$ (B) $x = 1$ (C) $x = -3/2$ (D) $x = 3/2$

51. Normals are drawn at points A, B, and C on the parabola $y^2 = 4x$ which intersect at P(h, k). The locus of the point P if the slope of the line joining the feet of two of them is 2, is

(A) $x + y = 1$ (B) $x - y = 3$ (C) $y^2 = 2(x - 1)$ (D) $y^2 = 2\left(x - \frac{1}{2}\right)$

52. Tangents are drawn from the point (– 1, 2) on the parabola $y^2 = 4x$. The length, these tangents will intercept on the line x = 2 is :

(A) 6 (B) $6\sqrt{2}$ (C) $2\sqrt{6}$ (D) none of these

53. Which one of the following lines cannot be the normals to $x^2 = 4y$?

(A) $x - y + 3 = 0$ (B) $x + y - 3 = 0$ (C) $x - 2y + 12 = 0$ (D) $x + 2y + 12 = 0$

54. Length of the intercept on the normal at the point $P(at^2, 2at)$ of the parabola $y^2 = 4ax$ made by the circle described on the focal distance of the point P as diameter is :

(A) $a\sqrt{2+t^2}$ (B) $\frac{a}{2}\sqrt{1+t^2}$ (C) $2a\sqrt{1+t^2}$ (D) $a\sqrt{1+t^2}$

55. Consider the graphs of $y = Ax^2$ and $y^2 + 3 = x^2 + 4y$, where A is a positive constant and $x, y \in R$. Number of points in which the two graphs intersect, is-

(A) exactly 4 (B) exactly 2

(C) at least 2 but the number of points varies for different positive values of A.

(D) zero for atleast one positive A.

56. Let BC be the latus rectum of the parabola $y^2 = 4x$ with vertex A. Minimum length of the projection of BC on a tangent drawn in the portion BAC is -

(A) 2 (B) $2\sqrt{3}$ (C) $2\sqrt{2}$ (D) $2+\sqrt{2}$

57. If the locus of the middle points of the chords of the parabola $y^2 = 2x$ which touches the circle $x^2 + y^2 - 2x - 4 = 0$ is given by $(y^2 + 1 - x)^2 = \lambda(1 + y^2)$, then the value of λ is equal to-

(A) 3 (B) 4 (C) 5 (D) 6

Assertion and Reason :

58. Consider a curve $C : y^2 - 8x - 2y - 15 = 0$ in which two tangents T_1 and T_2 are drawn from P(–4,1).

Statement-1 : T_1 and T_2 are mutually perpendicular tangents.

Statement-2 : Point P lies on the axis of curve C.

(A) Statement-1 is True, Statement-2 is True ; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True ; Statement-2 is NOT a correct explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False.

(D) Statement-1 is False, Statement-2 is True.