1. If θ is the angle between the pair of straight lines given by $x^2 - 3xy + \lambda y^2 + 3x - 5y + 2 = 0$, then $\text{cosec}^2\,\theta$ is equal to

(a) 9 (b) 10 (c) 15 (d) 26

2. The angle between the lines given by the equation $\lambda y^2 + (1 - \lambda^2)\,xy - \lambda x^2 = 0$ is same as the angle between the lines given by

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

(c) $x^2 - 2xy - 3y^2 = 0$ (d) $3x^2 - 10xy + 3y^2 = 0$

3. If one of the lines of the pair $ax^2 + 2\,hxy + by^2 = 0$ bisects the angle between the positive direction of the axes, then

(a) $h + a = b$ (b) $h + b = a$

(c) $a + b = h$ (d) $a + b + 2h = 0$

4. The line $x + y = 6$ is a normal to the parabola $y^2 = 8x$ at the point

(a) (18, – 12) (b) (4, 2) (c) (2, 4) (d) (3, 3)

5. If the eccentricity of a conic is 3/5, the conic is

(a) a parabola (b) an ellipse (c) a hyperbola (d) none of these

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

(a) all values of t (b) $t^2 = 2 + \sqrt{5}$

(c) $t^2 = 2 - \sqrt{5}$ (d) no real value of t

7. The number of real tangents that can be drawn to the ellipse $3x^2 + 5y^2 = 32$ and $25x^2 + 9y^2 = 450$ passing through (3, 5) is

(a) 0 (b) 2 (c) 3 (d) 4

8. The sum of the squares of the perpendiculars on any tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ from two points on the minor axis each at a distance $\sqrt{a^2 - b^2}$ from the centre is

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

9. The locus of the point of inter section of the tangents to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ which are at right angle is

(a) a circle (b) a parabola (c) an ellipse (d) a hyperbola

10. A line bisecting the ordinate PN of a point P $(at^2, 2at)$, $t > 0$, on the parabola $y^2 = 4ax$ is drawn parallel to the axis to meet the curve at Q. If NQ meets the tangent at the vertex at the point T, then the coordinates of T are

(a) $(0, (4/3)at)$ (b) $(0, 2at)$ (c) $((1/4)at^2, at)$ (d) $(0, at)$

11. If P, Q, R are three points on a parabola $y^2 = 4ax$ whose ordinates are in geometrical progression, then the tangents at P and R meet on the line through Q parallel to x–axis the line through Q parallel to y–axis the line joining Q to the vertex the line joining Q to the focus

12. If the normal drawn from the point on the axis of the parabola $y^2 = 8ax$ whose distance from the focus is 8a, and which is not parallel to either axis, makes an angle θ with the axis of x, then θ is equal to

(a) π/6 (b) π/4 (c) π/3 (d) none of these

13. The normal at an end of a latus rectum of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ passes through an end of the minor axis

(a) $e^4 + e^2 = 1$ (b) $e^3 + e^2 = 1$ (c) $e^2 + e = 1$ (d) $e^3 + c = 1$

14. $y = mx + c$ is a normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ if c^2 is equal to

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

15. The locus of the foot of the perpendicular drawn from the centre to any tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is

(a) a circle (b) an ellipse (c) a hyperbola (d) none of these

16. Sum of the focal distance of any point on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is equal to the length of the

(a) major axis (b) minor axis (c) latusrectum (d) none of these

17. The point of inter section 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.

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

18. Given the two ends of the latus rectum, the maximum number of parabolas that can be drawn is

(a) 1 (b) 2 (c) 0 (d) infinite

19. If the focus of a parabola is (–2, 1) and the directrix has the equation $x + y = 3$ then the vertex is

(a) (0, 3) (b) (–1, 1/2) (c) (–1, 2) (d) (2, – 1)

20. If the vertex and the focus of a parabola are (–1, 1) and (2, 3) respectively then the equation of the directrix is

(a) $3x + 2y + 14 = 0$ (b) $3x + 2y – 25 = 0$
(c) $2x – 3y + 10 = 0$ (d) None of these

21. If the vertex = (2, 0) and the extremities of the latus rectum are (3, 2) and (3, – 2) then the equation of the parabola is

(a) $y^2 = 2x – 4$ (b) $x^2 = 4y – 8$
(c) $y^2 = 4x – 8$ (d) none of these

22. Any point on the parabola whose focus is (0, 1) and the directrix is $x + 2 = 0$ is given by

(a) $(t^2 + 1, 2t – 1)$ (b) $(t^2 + 1, 2t – 1)$
(c) $(t^2, 2t)$ (d) $(t^2 – 1, 2t + 1)$

23. The equation $x^2 + 4xy + 4y^2 – 3x – 6y – 4 = 0$ represents a

(a) circle (b) parabola (c) a pair of lines (d) none of these

24. The equation $\lambda x^2 + 4xy + y^2 + \lambda x + 3y + 2 = 0$ represents a parabola if λ is

(a) -4 (b) 4 (c) 0 (d) none of these

25. The vertex of the parabola $(y - a)^2 = 4a(x + a)$ is

(a) $(-a, a)$ (b) $(a, -a)$ (c) $(-2a, 2a)$ (d) $\left(-\frac{a}{2}, \frac{a}{2}\right)$

26. The equation of the axis of the parabola $9y^2 - 16x - 12y - 57 = 0$ is

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

27. The length of the latus rectum of the parabola $169\{(x - 1)^2 + (y - 3)^2\} = (5x - 12y + 17)^2$ is

(a) $14/13$ (b) $28/13$ (c) $12/13$ (d) none of these

28. The parametric equation of a parabola is $x = t^2 + 1$, $y = 2t + 1$. The Cartesian equation of its directrix is

(a) $x = 0$ (b) $x + 1 = 0$ (c) $y = 0$ (d) none of these

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

(a) $(32, 32)$ (b) $(32, -32)$ (c) $(-2, 8)$ (d) none of these

30. A line L passing through the focus of the parabola $y^2 = 4(x - 1)$ intersects the parabola in two distinct points. If 'm' be the slope of the line L then

(a) $-1 < m < 1$ (b) $m < -1$ or $m > 1$ (c) $m \in R$ (d) none of these