Locus of the focus of Parabola is..

Areas; Differential Equations

Straight Objective Type

1. If 2 f(x) = f'(x) and f(0) = 3 then f(2) =
1) 3 2) 2 3) $3e^4$ 4) $4e^3$

2. Solution of the equation $(xy^4 + y)\,dx - xdy = 0$ is
1) $4x^4y^3 + 3x^3 = cy^3$
2) $3x^3y^4 + 4x^3 = cx^3$
3) $3x^4y^3 + 4x^3 = cy^3$
4) $2x^4y^3 + x^3 = cy^4$

3. The population p(t) at a time t of certain mouse species satisfies the differential equation $\frac{dp(t)}{dt} = 0.5\,p(t) - 450$. If p(0) = 850 then the time at which the population becomes zero is
1) 2 log18 2) log 9
3) $\frac{1}{2}$ log 18 4) $\frac{1}{2}$ log 9

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4. The radius of a circle having minimum area, which touches the curve $y = 4 - x^2$ and the lines y = |x| is .....
1) $2(\sqrt{2} - 1)$ 2) $4(\sqrt{2} - 1)$
3) $4(\sqrt{2} + 1)$ 4) $2(\sqrt{2} + 1)$

5. Area of the region in the first quadrant enclosed by the x – axis, the line y = x and the circle $x^2 + y^2 = 32$
1) 4π 2) 8π 3) 16π 4) 32π

6. The area bounded by $y^2 = 4ax$ and y = mx is $\frac{a^2}{3}$ square units then m = ...
1) 1 2) 2 3) 3 4) 4

7. Area bounded y = {x} where {.} fractional part and the lines x = ±1
1) 1 2) 2 3) 3 4) 4

8. The degree of the differential equation $x = 1 + \frac{dy}{dx} + \frac{1}{\angle 2}\left(\frac{dy}{dx}\right)^2 + \frac{1}{\angle 3}\left(\frac{dy}{dx}\right)^3 + \ldots$ is
1) 1 2) 2 3) 3 4) not defined

9. A curve passes through the point (4, 2) and at any point (x, y) on it. The product of its slope and the ordinate is equal to abscissa of the curve is ....
1) Parabola 2) Circle
3) Ellipse 4) Hyperbola

10. Integrating factor (I.F.) of the differential equation $(y^2 - x)\frac{dy}{dx} = 1$ is
1) e^x 2) e^y 3) e^{-x} 4) e^{-y}

11. Let y = f(x) is a solution of differential equation $e^y\frac{dy}{dx} - e^y = e^x$ and f(0) = 0 then f(1) =
1) log2 2) 3 + log2 3) log3 4) 1 + log2

12. At present a firm is manufacturing 2000 items. It is estimated that the rate of production p with respect to additional number of workers x is given by $\frac{dp}{dx} = (100 - 12\sqrt{x})$. If the firm employs 25 more workers, then the new level of production of items is
1) 2500 2) 3000 3) 3500 4) 4500

Numerical Value Type

13. The area bounded by $y = x^4 - 2x^3 + x^2 + 3$, axis of abscissa and two ordinates corresponding to two points of minima of the function y = f(x) is ....

14. The degree of the differential equation satisfying $\sqrt{1 + x^2} + \sqrt{1 + y^2} = k\,(x\sqrt{1 + y^2} - y\sqrt{1 + x^2})$ is ....

Key
1-3 2-3 3-1 4-2 5-1 6-2 7-1 8-1 9-4 10-2 11-4 12-3 13-3.03 14-3

Conics

Straight Objective Type

1. A movable parabola touches the x - axis and y - axis at (1 0) and (0 1). Then locus of the focus of parabola is
1) $2x^2 + 2y^2 + 2x + 2y + 1 = 0$
2) $2x^2 + 2y^2 - 2x - 2y + 1 = 0$
3) $x^2 + y^2 = 1$
4) $x^2 + y^2 - x - y + 1 = 0$

2. Radius of the largest circle which passes through the focus of the parabola $y^2 = 4x$ and contained in it is
1) 4 2) 8 3) 16 4) 1

3. If S is the focus of the parabola $y^2 = 8x$, P is a point on the parabola. The normal at P meets the axis in G. If SPG is an equilateral triangle then P =
1) $(6\ \ 4\sqrt{3})$ 2) (2 4)
3) $(4\ \ 4\sqrt{2})$ 4) $(3\ \ 2\sqrt{3})$

4. If $y + 3 = m_1(x + 2)$, $y + 3 = m_2(x + 2)$ are two tangents the parabola $y^2 = 8x$ then angle between two tangents is
1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

5. A ray of light along the line x = 3 is reflected at the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ The slope of the reflected ray is
1) $\frac{4}{15}$ 2) $\frac{8}{15}$ 3) $\frac{15}{8}$ 4) $\frac{15}{4}$

6. Let P_i and P_i' be the feet the perpendicular drawn from S, S' on a tangent T_i to an ellipse whose length of semi major axis is

20. If $\sum_{i=1}^{10}(SP_i)\,(S'P_i') = 2560$ then eccentrity of the ellipse is (where S, S' are foci)
1) $\frac{1}{5}$ 2) $\frac{2}{5}$ 3) $\frac{3}{5}$ 4) $\frac{4}{5}$

7. The slopes of common tangents to the hyperbolas $\frac{x^2}{9} - \frac{y^2}{16} = 1$ and $\frac{y^2}{9} - \frac{x^2}{16} = 1$ are
1) ±1 2) ±2 3) $\pm\sqrt{2}$ 4) ±3

8. The graph represented by the equation $x = \sin^2 t$ and $y = 2\cos t$ is
1) a part of a sine graph 2) hyperbola
3) a portion of a parabola 4) a parabola

9. The value of k such that the vertex of $y = x^2 + 2kx + 13$ is 4 units above the x–axis is
1) ±1 2) ±2 3) ±3 4) ±4

10. If S, S' are two foci of an ellipse $16x^2 + 25y^2 = 400$ and PSQ is a focal chord such that SP = 16 then S'Q = ...
1) 20 2) $\frac{70}{9}$ 3) $\frac{74}{9}$ 4) $\frac{74}{11}$

11. If the equation $(10x - 5)^2 + (10y - 4)^2 = \lambda^2(3x + 4y - 1)^2$ represents a hyperbola then λ lies in the interval
1) (–2 2) 2) $(-\infty\ -2) \cup (2\ \infty)$
3) (2 ∞) 4) (0 2)

Numerical Value Type

12. The line y = mx + c (m > 0) tangent to $y^2 = 8(x + 2)$ then the minimum value of c is .....

13. If e_1, e_2, e_3 are the eccentricities of a parabola (P) ellipse (E) and hyperbola (H) so that $e_1^2 + e_2^2 + e_3^2 = \frac{46}{9}$, $e_1^2 - e_2^2 + e_3^2 = \frac{44}{9}$ and eccentrity of conjugate hyperbola (H) is $\frac{2}{K}$ then the value of K =

14. If foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ and the hyperbola $\frac{x^2}{4} - \frac{y^2}{k} = 1$ coincide then k =

15. If S, S' are foci of an ellipse of major axis of length 10 units and P is any point on the ellipse such that perimeter of triangle PSS' is 15. Then eccentricity of ellipse is....

16. Equations of directrix and latusrectum of a parabola are 3x – 4y + 17 = 0 and 3x – 4y + 2 = 0 then the length of latusrectum =

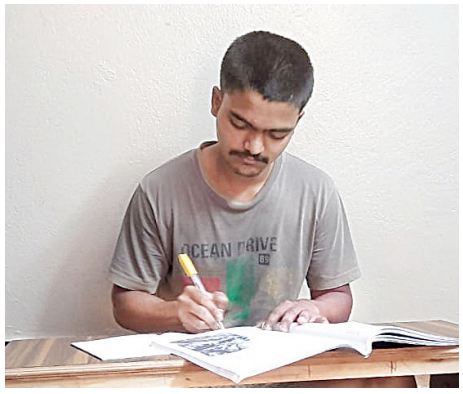
17. Number of focal chords of the parabola $y^2 = 9x$ whose length is less than 9 is...

18. If F_1 and F_2 are the feet of perpendiculars from foci S_1 and S_2 of an ellipse $\frac{x^2}{5} + \frac{y^2}{3} = 1$ on the tangent at any point P on the ellipse then $(S_1\ \ F_1)\,(S_2\ \ F_2)$ =....

19. If $4x^2 + y^2 = 1$ then maximum value of $12x^2 - 3y^2 + 16xy$ is

20. Radius of director circle of a rectangular hyperbola is

Key
1-2 2-1 3-1 4-4 5-2 6-3 7-1 8-3 9-3 10-3 11-2 12-4 13-1.73 14-5 15-0.5 16-6 17-0 18-3 19-5 20-0



JEE MAIN
Mathematics

Circles and System of Circles

Straight Objective Type

1. The sum of the square of length of the chord intercepted by the line x + y = n ($n \in N$) on the circle $x^2 + y^2 = 4$ is
1) 11 2) 22 3) 33 4) 44

2. Let C be the circle with centre at (1 1) and radius 1. If T is another circle centre at (0, α) passing through (0, 0), touching the circle C externally then the radius of the circle T is
1) $\frac{1}{\sqrt{2}}$ 2) $\frac{1}{2}$ 3) $\frac{1}{3}$ 4) $\frac{1}{4}$

3. If a line passes through the point P(1 –2) and cuts the circle $x^2 + y^2 - x - y = 0$ at A, B then the maximum value of PA + PB is
1) $\sqrt{26}$ 2) $\sqrt{17}$ 3) 3 4) $2\sqrt{3}$

4. Let $x^2 + y^2 - ax - y = 0$ be a circle. If the two chords from (a 1) bisected by x - axis are drawn to the circle then the condition is
1) $a^2 > 8$ 2) $a^2 < 8$
3) $a^2 > 4$ 4) $a^2 < 4$

5. The radius of the least circle passing through the point P (8, 4) and cutting the circle $x^2 + y^2 - 40 = 0$ orthogonally is
1) $\sqrt{3}$ 2) $\sqrt{5}$ 3) $\sqrt{7}$ 4) 3

6. If 3, 4 are the radii and 5 is the distance between the centres of two intersecting circles then the length of common chord of the circle is
1) $\frac{12}{5}$ 2) $\frac{24}{25}$ 3) $\frac{24}{5}$ 4) $\frac{5}{24}$

7. If the circles $x^2 + y^2 = 2$ and $x^2 + y^2 - 4x - 4y + \lambda = 0$ have exactly three real common tangents then λ =
1) –10 2) 6 3) –6 4) 10

8. If $\left(m_i, \frac{1}{m_i}\right)$, $m_i > 0$, i = 1, 2, 3, 4 are four distinct points on a circle then $m_1\,m_2\,m_3\,m_4$ =
1) 4 2) –1 3) 1 4) –4

9. If the distance between the centres of two circles of radii 3, 4 is 25. Then the length of the transverse common tangent is
1) 24 2) 17 3) 9 4) 26

Numerical Value Type

10. ABCD is a square of unit area. A circle is tangent to two sides of square ABCD and passes through exactly one of its vertices. The radius of the circle is

11. If the circle $3x^2 + 3y^2 + 10x + y - 27 = 0$ bisects the circumference of the circle $x^2 + y^2 = r$ then the value of $\left(\frac{r}{3}\right)^2$ =

12. A right angled isosceles triangle is inscribed in the circle $x^2 + y^2 - 4x - 2y - 4 = 0$, then length of its side is

13. The perpendicular distance from (1, –2) from the common chord of two circles $x^2 + y^2 - 5x + 4y - 2 = 0$ and $x^2 + y^2 - 2x + 8y + 3 = 0$ is

14. A circle is inscribed in an equilateral triangle of side '6'. Then the area of any square inscribed in this circle is

15. The shortest distance from (–2 14) to the circle $x^2 + y^2 - 6x - 4y - 12 = 0$ is

16. If the lines 3x – 4y + 4 = 0, 6x – 8y – 7 = 0 are tangent to a circle, then the radius of the circle is

17. If an equilateral triangle is inscribed in the circle $x^2 + y^2 - 6x - 4y + 5 = 0$ and the length of side the triangle is $K\sqrt{6}$ then K =

Key
1-2 2-4 3-1 4-1 5-2 6-3 7-3 8-3 9-1 10-0.59 11-9 12-4.23 13-0 14-6 15-8 16-0.75 17-2