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India's Number 1 Education App

MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

PARABOLA

Examples

1. Find the locus of a point , which moves such that its distance from the point (0,-1) is twice its distance from the line 3x+4y+1=0.

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2. What conic does the equation

$25\left(x^2+y^2-2x+1\right)=(4x-3y+1)^2$ represent?

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3. What conic does

$13x^2-18xy+37y^2+2x+14y-2=0$ represent?

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4. Statement I The conic $\sqrt{a}x+\sqrt{b}y=1$ represents a parabola.

Conic

$ax^2+2hxy+by^2+2gx+2fy+c=0$ represents a parabola, if $h^2=ab$.

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5. If the equation $x^2 - y^2 - 2x + 2y + \lambda = 0$ represent a degenerate conic . Find the value of λ.

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6. If the equation $x^2 - y^2 - 2x - 2y + c = 0$ represent an empty set , then find the value of c.

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7. IF the equation of conic

$2x^2 + xy + 3y^2 - 3x + 5y + \lambda = 0$ represent a single

point, then find the value of λ

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8. For What value of λ the equation of conic 2xy+4x-6y+λ=0 represents two intersecting straight lines, if $\lambda = 17$, then this equation represents?

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9. The centre of the conic $14x^2 - 4xy + 11y^2 - 44x - 58y + 71 = 0,$ is

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10. Find the equation of the parabola whose focus is at (-1,-2) and the directrix the line $x - 2y + 3 = 0$

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11. Find the equation of the parabola whose focus is (4,-3) and vertex is (4,-1).

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12. The focal distance of a point on a parabola $y^2 = 8x$ is 8. Find it .

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13. PQ is a double ordinate of a parabola $y^2 = 4ax$. Find the locus of its points of trisection.

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14. Prove that the area of the traingle inscribed in the parabola $y^2 = 4ax$ is $\frac{1}{8a}(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)$, where y_1, y_2, y_3 are the ordinates of the vertices.

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15. An equilateral triangle is inscribed in the parabola $y^2 = 4ax$ where are at the vertex of the parabola. find the length of the side of the triangle.

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16. The equation of the parabola whose focus is the point (0, 0) and the tangent at the vertex is $x - y + 1 = 0$ is

$x^2 + y^2 - 2xy - 4x - 4y - 4 = 0$

$x^2 + y^2 - 2xy + 4x - 4y - 4 = 0$

$x^2 + y^2 + 2xy - 4x + 4y - 4 = 0$

$x^2 + y^2 + 2xy - 4x - 4y + 4 = 0$

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17. Find the equation of the parabola whose latus-rectum is 4 units, axis is the line 3x+4y-4=0 and the tangent at the vertex is the line 4x-3y+7=0

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18. Find the vertex , focus , latusrectum, axis and the directrix of the parabola $x^2 + 8x + 12y + 4 = 0$.

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19. Prove that the equation $y^2 + 2ax + 2by + c = 0$ represent a parabola whose axis is parallel to the axis of x. Find its vertex.

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20. Find the equation of the parabola with its vertex at (3,2) and its focus at (5,2).

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21. Find the equation of the parabola with latusrectum joining the points (3,6) and (3,-2).

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22. Find the equation to the parabola whose axis parallel to the y-axis and which passes through the points (0,4)(1,9) and (4,5) and determine its latusrectum.

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23. Show that the point (2,3) lies outside the parabola $y^2 = 3x$.

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24. Find the position of the point (-2,2) with respect to the parabola $y^2 - 4y + 9x + 13 = 0$.

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25. If the point $(at^2, 2at)$ be the extremity of a focal chord of parabola $y^2 = 4ax$ then show that the length of the focal chord is $a\left(t + \frac{t}{1}\right)^2$.

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26. Prove that the semi-latus rectum of the parabola y^(2) = 4ax` is the harmonic mean between the segments of any focal chord of the parabola.

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27. Show that the focal chord, of parabola $y^2 = 4ax$, that makes an angle α with the x-axis is of length $4a \cos ec^2 \alpha$.

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28. Prove that the length of a focal chord of a parabola varies inversely as the square of its distance from the vertex.

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29. Prove that the straight line lx+my+n=0 touches the parabols $y^2 = 4ax$, if $\ln = am^2$.

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30. Show that the line $x\cos\alpha + y\sin\alpha = p$ touches the parabola $y^2 = 4ax$ if $p\cos\alpha + a\sin^2\alpha = 0$

and that the point of contact is $\left(a\tan^2\alpha,\ -2a\tan\alpha\right)$.

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31. Prove that the line $\frac{x}{l} + \frac{y}{m} = 1$ touches the parabola $y^2 = 4a(x+b)$, if $m^2(l+b) + al^2 = 0$.

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32. Find the equation of the straight lines touching lines both $x^2 + y^2 = 2a^2$ and $y^2 = 8ax$.

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33. The equation of the common tangent to the parabolas $y^2 = 4ax$and $x^2 = 4by$ is given by

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34. Two tangents to the parabola $y^2 = 4ax$ make supplementary angles with the x-axis. Then the locus of their point of intersection is

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35. Show that the locus of the point of intersection of mutually perpendicular tangetns to a parabola is its directrix.

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36. The tangents to the parabola $y^2 = 4ax$ at $P\left(at_1^2, 2at_1\right)$, and $Q\left(at_2^2, 2at_2\right)$, intersect at R. Prove that the area of the triangle PQR is $\frac{1}{2}a^2(t_1 - t_2)^3$

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37. Show that normal to the parabols $y^2 = 8ax$ at the point (2,4) meets it again at (18.-12) . Find also the length of the normal chord.

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38. Prove that the chord $y - x\sqrt{2} + 4a\sqrt{2} = 0$ is a normal chord of the parabola $y^2 = 4ax$. Also, find the point on the parabola when the given chord is normal to the parabola.

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39. 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

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40. Prove that the normal chord to a parabola at the point whose ordinate is equal to the abscissa subtends a right angle at the focus.

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41. IF the normal to the parabola $y^2 = 4ax$ at point t_1 cuts the parabola again at point t_2, prove that $t_2^2 \geq 8$

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42. Show that the locus of points such that two of the three normals drawn from them to the parabola $y^2 = 4ax$

coincide is $27ay^2 = 4(x - 2a)^3$.

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43. The locus of the point through which pass three normals to the parabola $y^2 = 4ax$, such that two of them make angles $\alpha\&\beta$ respectively with the axis & $\tan\alpha \cdot \tan\beta = 2$ is $(a > 0)$

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44. Find the locus of a point which is such that, the three normals through it cut the axis in points whose distance from the vertex are in A.P.

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45. The normals at P, Q, R on the parabola $y^2 = 4ax$ meet in a point on the line $y = c$. Prove that the sides of the triangle PQR touch the parabola $x^2 = 2cy$.

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46. Find the point on the axis of the parabola $3y^2 + 4y - 6x + 8 = 0$ from when three distinct normals can be drawn.

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47. A circle cuts the parabola $y^2 = 4ax$ at right angles and passes through the focus , show that its centre lies on the

curve $y^2(a+2x) = a(a+3x)^2$.

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48. Show that the length of the chord of contact of the tangents drawn from (x_1, y_1) to the parabola $y^2 = 4ax$ is $\frac{1}{a}\sqrt{(y_1^2 - 4ax_1)(y_1^2 + 4a^2)}$

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49. Area of the triangle formed by the tangents from (x_1, y_1) to the parabola $y^2 = 4ax$ and its chord of contact is $\frac{(y_1^2 - 4ax_1)^{\frac{3}{2}}}{2a} = \frac{S_{11}^{\frac{3}{2}}}{2a}$

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50. Find the locus of the mid-points of the chords of the parabola $y^2 = 4ax$ which subtend a right angle at vertex of the parabola.

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51. The locus of the middle points of normal chords of the parabola $y^2 = 4ax$ is-

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52. If the diameter through any point P of a parabola meets any chord in A and the tangent at the end of the chord

meets the diameter in B and C, then prove that $PA^2 = PB.PC$

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53. Find the equations of the tangent and normal to the parabola $y^2 = 4ax$ at the point $(at^2, 2at)$.

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54. A ray of light is coming along the line $y = b$ from the positive direction of x-axis and striks a concave mirror whose intersection with xy-plane is a parabola $y^2 = 4ax$. Find the equation of the reflected ray and show that it passes

through the focus of the parabola. Both a and b are positive.

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55. Find the length of latusrectum intersect at the focus S its coordinate are detained by solving.

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56. A ray of light travels along a line $y = 4$ and strikes the surface of curves $y^2 = 4(x + y)$. Then the equations of the line along which of reflected ray travels is $x = 0$ (b) $x = 2$ (c) $x + y$ (d) $2x + y = 4$

A. x=0

B. x=2

C. x+y=4

D. 2x+y=4

Answer: A

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57. A parabola is drawn with focus at (3,4) and vertex at the focus of the parabola $y^2 - 12x - 4y + 4 = 0$. The equation of the parabola is

A. $x^2 - 6x + 8y + 25 = 0$

B. $y^2 - 8x - 6y + 25 = 0$

C. $x^2 - 6x + 8y - 25 = 0$

D. $x^2 + 6x - 8y - 25 = 0$

Answer: D

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58. Two parabola have the same focus. If their directrices are the x-axis and the y-axis respectively, then the slope of their common chord is :

A. ± 1

B. $\frac{4}{3}$

C. $\frac{3}{4}$

D. None of these

Answer: A

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59. Let us define a region R is xy-plane as a set of points (x,y) satisfying $\left[x^2\right] = [y]$ (where [x] denotes greatest integer $\leq x$),then the region R defines

A. a parabola whose axis is horizontal

B. a parabola whose axis is vertical

C. integer point of the parabola $y = x^2$

D. None of the above

Answer: D

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60. The minimum area of circle which touches the parabolas $y = x^2 + 1$ and $y^2 = x - 1$ is

A. $\frac{9\pi}{16}$ sq units

B. $\frac{9\pi}{32}$ sq units

C. $\frac{9\pi}{8}$ sq units

D. $\frac{9\pi}{4}$ sq units

Answer: B

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61. If a line $x + y = 1$ cut the parabola $y^2 = 4ax$ in points A and B and normals drawn at A and B meet at C. The normals to the parabola from C other than above two meets the

parabola in D, then point D is : (A) (a, a) (B) $(2a, 2a)$ (C) $(3a, 3a)$ (D) $(4a, 4a)$

A. (a,2a)

B. $\left(\frac{4am}{l^2}, \frac{4a}{l}\right)$

C. $\left(\frac{2am^2}{l^2}, \frac{2a}{l}\right)$

D. $\left(\frac{4am^2}{l^2}, \frac{4am}{l}\right)$

Answer: D

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62. If d is the distance between the parallel tangents with positive slope to $y^2 = 4ax$ and

A. $10 < d < 20$

B. $4 < d < 6$

C. $d < 4$

D. None of these

Answer: C

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63. Two parabolas C and D intersect at two different points, where C is $y = x^2 - 3$ and D is $y = kx^2$. The intersection at which the x value is positive is designated Point A, and x=a at this intersection the tangent line l at A to the curve D intersects curve C at point B , other than A. IF x-value of point B is 1, then a equal to

A. 1

B. 2

C. 3

D. 4

Answer: C

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64.

$\min\left[\left(x_1 - x^2\right)^2 + \left(3 + \sqrt{1 - x_1^2} - \sqrt{4x_2}\right)\right],\ \forall x_1, x_2 \in R,$

is

A. $4\sqrt{5} + 1$

B. $3 - 2\sqrt{2}$

C. $\sqrt{5} + 1$

D. $\sqrt{5}-1$

Answer: B

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65. The condition that the parabolas $y^2 = 4c(x-d)$ and $y^2 = 4ax$ have a common normal other than X-axis $(a > 0, c > 0)$ is

A. $2a < 2c + d$

B. $2c < 2a + d$

C. $2d < 2a + c$

D. $2d < 2c + a$

Answer: A

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66. The locus of the mid-point of the focal radii of avariable point moving on the parabola, $y^2 = 4ax$ is C, then the length of latus rectum of C, is

A. latusrectum is half the latusrectum of the original parabola

B. Vertex is $\left(\frac{a}{2}, 0\right)$

C. directrix is Y-axis

D. focus has the coordinate (a,0)

Answer: D

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67. IF P_1P_2 and Q_1Q_2 two focal chords of a parabola $y^2 = 4ax$ at right angles, then

A. area of the quadrilateral $P_1Q_1P_2Q_2$ is minimum when the chords are inclined at an angle $\pi/4$ to the axis of the parabola.

B. minimum area is twice the area of the square on the latusrectum of the parabola.

C. minimum area of quadrilateral $P_1Q_1P_2Q_2$ cannot be found

D. minimum area is thrice the area of the square on the latusrectum of the parabola.

Answer: A

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68. The equation of the line that touches the curves $y = x|x|$ and $x^2 + \left(y^2 - 2\right)^2 = 4$, where $x \neq 0$, is

$y = 4\sqrt{5}x + 20$ (b) $y = 4\sqrt{3}x - 12$ $y = 0$ (d) $y = -4\sqrt{5}x - 20$

A. $y = 4\sqrt{5}x + 20$

B. $y = 4\sqrt{3}x - 12$

C. $y = 0$

D. $y = -4\sqrt{5}x - 20$

Answer: A

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69. Let V be the vertex and L be the latusrectum of the parabola $x^2 = 2y + 4x - 4$. Then the equation of the parabola whose vertex is at V. Latusrectum $L/2$ and axis s perpendicular to the axis of the given parabola.

A. $y^2 = x - 2$

B. $y^2 = x - 4$

C. $y^2 = 2 - x$

D. $y^2 = 4 - x$

Answer: A,C

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70. Consider a circle with its centre lying on the focus of the parabola, $y^2 = 2px$ such that it touches the directrix of the parabola. Then a point of intersection of the circle & the parabola is:

A. $\left(\frac{a}{2}, a\right)$

B. $\left(\frac{a}{2}, -a\right)$

C. $\left(-\frac{a}{2}, a\right)$

D. $\left(-\frac{a}{2}, -a\right)$

Answer: A

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71. Tangents are drawn to the parabola $y^2 = 4ax$ at the point P which is the upper end of latusrectum .

Image of the parabola $y^2 = 4ax$ in the tangent line at the point P is

A. $(x + y)^2 = 16y$

B. $(x + 2)^2 = 8(y - 2)$

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

D. $(x - 2)^2 = 2(y - 2)$

Answer: C

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72. Tangents are drawn to the parabola $y^2 = 4x$ at the point P which is the upper end of latusrectum . Radius of the circle touching the parabola $y^2 = 4x$ at the point P and passing through its focus is

A. 1

B. $\sqrt{2}$

C. $\sqrt{3}$

D. 2

Answer: B

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73. Tangents are drawn to the parabola $y^2 = 4x$ at the point P which is the upper end of latusrectum . Area enclosed by the tangent line at, P,X axis and the parabola is

A. $\frac{2}{3}$sq units

B. $\frac{4}{3}$ sq units

C. $\frac{14}{3}$ sq units

D. $\frac{16}{3}$ sq units

Answer: A

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74. Let C_1 and C_2 be parabolas $x^2 = y - 1$ and $y^2 = x - 1$ respectively. Let P be any point on C_1 and Q be any point C_2.

Let P_1 and Q_1 be the reflection of P and Q, respectively w.r.t the line y = x then prove that P_1 lies on C_2 and Q_1 lies on C_1 and $PQ \geq [PP_1, QQ_1]$. Hence or otherwise , determine points P_0 and Q_0 on the parabolas C_1 and C_2 respectively such that $P_0Q_0 \leq PQ$ for all pairs of points (P,Q) with P on C_1 and Q on C_2

A. C_1 and C_2 respectively

B. C_2 and C_1 respectively

C. Cannot be determined

D. None of these

Answer: B

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75. Let C_1 and C_2 be respectively, the parabolas $x^2 = y = -1$ and $y^2 = x - 1$ Let P be any point on C_1 and Q be any point on C_2 . Let P_1 and Q_1 be the refelections of P and Q, respectively with respect to the line y=x.

If the point $p(\pi, \pi^2 + 1)$ and $Q(\pi^2 + 1\mu)$ then P_1 and Q_1 are

A. $(\pi^2 + 1, \pi)$ and $(\mu^2 + 1, \mu)$

B. $(\mu^2 + 1, \mu)$ and $(\mu, \mu^2 + 1)$

C. $(\mu, \mu^2 + 1)$ =and $(\mu, \mu^2 + 1)$

D. $(\pi, \pi^2 + 1)$ =and $(\mu^2, 1 + \mu)$

Answer: B

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76. Let C_1 and C_2 be respectively, the parabolas $x^2 = y = -1$ and $y^2 = x - 1$ Let P be any point on C_1 and Q be any point on C_2 . Let P_1 and Q_1 be the refelections of P and Q, respectively with respect to the line y=x.

Arithemetic mean of $PP_1$and QQ_1 is always less than

A. PQ

B. $\frac{1}{2}$PQ

C. 2PQ

D. $\frac{3}{2}$PQ

Answer: A

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77. Points A, B, C lie on the parabola $y^2 = 4ax$ The tangents to the parabola at A, B and C, taken in pair, intersect at points P, Q and R. Determine the ratio of the areas of the $\triangle ABC$ and $\triangle PQR$

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78. If the orthocentre of the triangle formed by the points t_1, t_2, t_3 on the parabola $y^2 = 4ax$ is the focus, the value of $|t_1t_2 + t_2t_3 + t_3t_1|$ is

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79. (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.

Statement I through the point $(\pi, \pi+1), \pi < 2$, there cannot be more than one normal to the parabola $y^2 = 4ax$.

Statement II The point $(\pi, \pi+1)$ cannot lie inside the parabola $y^2 = 4ax$.

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80. (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.

Statement I If there exist points on the circle $x^2 + y^2 = \pi^2$ from which two perpendicular tangents can be drawn to the parabola $y^2 = 2ax$, then $\pi \geq \frac{1}{2}$. Statement II Perpendicular tangents to the parabola meet at the directrix.

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81. Parabola $y^2 = 4a(x - c_1)$ and $x^2 = 4a(y - c_2)$, where $c_1 and c_2$ are variable, are such that they touch each other. The locus of their point of contact is $xy = 2a^2$ (b) $xy = 4a^2$ $xy = a^2$ (d) none of these

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82. Show that the area formed by the normals to $y^2 = 4ax$ at the points t_1, t_2, t_3 is

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83. If the parabolas $y^2 = 4ax$ and $y^2 = 4c(x - b)$ have a common normal other than the x-axis $(a, b, c$ being distinct positive real numbers), then prove that $\frac{b}{a - c} > 2$.

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84. If on a given base BC, a triangle is described such that the sum of the tangents of the base angles is m, then

prove that the locus of the opposite vertex A is a parabola.

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85. A parabola mirror is kept along $y^2 = 4x$ and two light rays parallel to its axis are reflected along one straight line. If one of the incident light rays is at 3 units distance from the axis, then find the distance of the other incident ray from the axis.

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86. Prove that the length of the intercept on the normal at the point $P\left(at^2, 2at\right)$ of the parabola $y^2 = 4ax$ made by

the circle described on the line joining the focus and P as diameter is $a\sqrt{1+t^2}$.

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87. If parabola of latus rectum touches a fixed equal parabola, the axes of the two curves being parallel, then the locus of the vertex of the moving curve is

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88. The normal at point P on a given parabola meet the axis of parabola at Q. Then prove that a line through Q and perpendicular to this normal always touches a fixed a

parabola whose length of latusrectum is same as that of given parabola.

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89. TP and TQ are any two tangents to a parabola and the tangent at a third point R cuts them in P' and Q'. Prove that $\frac{TP'}{TP} + \frac{TQ'}{TQ} = 1$

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90. Prove that on the axis of any parabola there is a certain point 'k' which has the property that, if a chord PQ of parabola be drawn through it then $\frac{1}{(PK)^2} + \frac{1}{(QK)^2}$ is the same for all positions of the chord.

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91. IF the distribution of weight is uniform, then the rope of the suspended bridge takes the form of parabola.The height of the supporting towers is 20m, the distance between these towers is 150m and the height of the lowest point of the rope from the road is 3m. Find the equation of the parabolic shape of the rope considering the floor of the parabolic shape of the rope considering the floor of the bridge as X-axis and the axis of the parabola as Y-axis. Find the height of that tower which supports the rope and is at a distance of 30 m from the centre of the road.

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92. Tangent is drawn at any point (x_1, y_1) on the parabola $y^2 = 4ax$. Now tangents are drawn from any point on this tangent to the circle $x^2 + y^2 = a^2$ such that all the chords of contact pass throught a fixed point (x_2, y_2) Prove that $4\left(\frac{x_1}{x_2}\right) + \left(\frac{y_1}{y_2}\right)^2 = 0.$

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93. If a chord PQ of the parabola $y^2 = 4ax$ subtends a right angle at the vertex, show that the locus of the point of intersection of the normals at P and Q is $y^2 = 16a(x - 6a).$

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94. Equilateral traingles are circumscribed to the parabola $y^2 = 4ax$. Prove that their angular points lie on the conic $(3x + a)(x + 3a) = y^2$

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95. A parabola is drawn to pass through A and B, the ends of a diameter of a given circle of radius a, and to have as directrix a tangent to a concentric circle of radius the axes of reference being AB and a perpendicular diameter, prove that the locus of the focus of parabola $\frac{x^2}{a^2} + \frac{y^2}{b^2 - a^2} = 1$

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96. Two straight lines are perpendicular to each other. One of them touches the parabola $y^2 = 4a(x + a)$ and the other touches $y^2 = 4b(x + b)$. Their point of intersection lies on the line. $x - a + b = 0$ (b) $x + a - b = 0$ $x + a + b = 0$ (d) $x - a - b = 0$

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Exercise For Session 1

1. The vertex of the parabola $y^2 + 6x - 2y + 13 = 0$ is

A. (-2,1)

B. (2,-1)

C. (1,1)

D. (1,-1)

Answer: A

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2. IF the parabola $y^2 = 4ax$ passes through (3,2) then the length of latusrectum is

A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. 1

D. $\frac{4}{3}$

Answer: D

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3. The value of p such that the vertex of $y = x^2 + 2px + 13$ is 4 units above the X-axis is

A. ± 2

B. 4

C. ± 3

D. 5

Answer: C

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4. The length of the latusrectum of the parbola whose focus is (3, 3) and directrix 3x-4y-2=0, is

A. 1

B. 2

C. 4

D. 8

Answer: B

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5. If the vertex and focus of a parabola are (3,3) and (-3,3) respectively, then its equation is

A. $x^2 - 6x + 24y - 63 = 0$

B. $x^2 - 6x + 24y - 81 = 0$

C. $y^2 - 6y + 24x - 63 = 0$

D. $y^2 - 6y - 24x + 81 = 0$

Answer: C

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6. If the vertex of the parabola $y = x^2x + c$ lies on x-axis, then the value of c, is

A. 4

B. -4

C. 16

D. -16

Answer: C

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7. The parabola having its focus at (3,2) and directrix along the Y-axis has its vertex at

A. $\left(\frac{3}{2}, 1\right)$

B. $\left(\frac{3}{2}, 2\right)$

C. $\left(\frac{3}{2}, \frac{1}{2}\right)$

D. $\left(\frac{3}{2}, -\frac{1}{2}\right)$

Answer: B

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8. The directrix of the parabola $x^2 - 4x - 8y + 12 = 0$ is

A. y=0

B. x=1

C. y=-1

D. x=-1

Answer: C

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9. The equation of the latusrectum of the parabola $x^2 + 4x + 2y = 0$ is

A. 3y-2=0

B. 3y+2=0

C. 2y-3=0

D. 2y+3=0

Answer: C

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10. The focus of the parabola $x^2 - 8x + 2y + 7 = 0$ is

A. $\left(0, -\frac{1}{2}\right)$

B. (4,4)

C. $\left(4, \frac{9}{2}\right)$

D. $\left(-4, -\frac{9}{2}\right)$

Answer: B

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11. The equation of the parabola with the focus (3,0) and directrix x+3=0 is

A. $y^2 = 2x$

B. $y^2 = 3x$

C. $y^2 = 6x$

D. $y^2 = 12x$

Answer: D

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12. Equation of the parabola whose axis is parallel to Y- axis and which passes through the point (1,0),(0,0)and (-2,4) , is

A. $2x^2 + 2y = 3y$

B. $2x^2 - 2x = 3y$

C. $2x^2 + 2x = y$

D. $2x^2 - 2x = y$

Answer: B

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13. Find the equation of the parabola whose focus is (5,3) and directrix is the line 3x-4y+1=0.

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14. Find the equation of the parabola, if the focus is at $(-6, -6)$ and the vertex is at $(-2, 2)$

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15. Find the vertex , focus, axis , directrix and latusrectum of the parabola $4y^2 + 12x - 20y + 67 = 0$.

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16. Find the name of the conic represented by $\sqrt{\left(\frac{x}{a}\right)} + \sqrt{\left(\frac{y}{b}\right)} = 1.$

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17. The curve described parametrically by $x = t^2 + t + 1$, y = $t^2 - t + 1$ represents :

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18. Prove that the equation of the parabola whose vertex and focus are on the X-axis at a distance a and a'from the origin respectively is $y^2 = 4(a' - a)(x - a)$

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19. Find the equation of the parabola whose axis is parallel to X-axis and which passes through the point (0,4),(1,9) and

(-2,6) . Also, find its latusrectum.

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20. The equation $ax^2 + 4xy + y^2 + ax + 3y + 2 = 0$ represents a parabola, then find the value of a.

A. 8

B. -4

C. -8

D. 4

Answer: D

Watch Video Solution

Exercise For Session 2

1. IF $2x + y + \lambda = 0$ is a normal to the parabola $y^2 = -8x$, then the value of λ is

A. -24

B. -16

C. -8

D. 24

Answer: D

Watch Video Solution

2. A normal chord of the parabola $y^2 = 4ax$ subtends a right angle at the vertex if its slope is

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}$

C. $-\frac{1}{\sqrt{2}}$

D. $-\sqrt{2}$

Answer: B::D

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3. The common tangent to the parabola $y^2 = 4ax$ and $x^2 = 4ay$ is

A. x+y+a=0

B. x+y-a=0

C. x-y+a=0

D. x-y-a=0

Answer: A

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4. The circle $x^2 + y^2 + 4\lambda x = 0$ which $\lambda \in R$ touches the parabola $y^2 = 8x$. The value of λ is given by

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5. If the normals at two points P and Q of a parabola $y^2 = 4ax$ intersect at a third point R on the curve, then the product of ordinates of P and Q is (A) $4a^2$ (B) $2a^2$ (C) $-4a^2$ (D) $8a^2$

A. $4a^2$

B. $2a^2$

C. $-4a^2$

D. $8a^2$

Answer: D

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6. The normals at three points P, Q, R of the parabola $y^2 = 4ax$ meet in (h, k) The centroid of triangle PQR lies on (A)x=0(B)y=0(C)x=-a(D)y=a`

A. x=0

B. y=0

C. x=-a

D. y=a

Answer: D

Watch Video Solution

7. The set of points on the axis of the parabola $y^2 - 4x - 2y + 5 = 0$ from which all the three normals to

the parabola are real , is

A. $\lambda, 0), x > 1$

B. $(\lambda, 1), \lambda > 3$

C. $(\lambda, 2), \lambda > 6$

D. $(\lambda, 3), \lambda > 8$

Answer: B

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8. Prove that any three tangents to a parabola whose slopes are in harmonic progression enclose a triangle of constant area.

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9. prove that the locus of the point of intersection of the tangents at the extremities of any chord of the parabola $y^2 = 4ax$ which subtends a right angle at the vertes is $x + 4a = 0$.

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10. Find the equation of the normal to the parabola $y^2 = 4x$ which is

parallel to the line y=2x-5.

Watch Video Solution

11. Find the equation of the normal to the parabola $y^2 = 4x$ which is

perpendicular to the line 2x+6y+5=0.

Watch Video Solution

12. The ordinates of points P and Q on the parabola $y^2 = 12x$ are in the ration 1:2 . Find the locus of the point of intersection of the normals to the parabola at P and Q.

Watch Video Solution

13. The normals at P, Q, R on the parabola $y^2 = 4ax$ meet in a point on the line $y = c$. Prove that the sides of the

triangle PQR touch the parabola $x^2 = 2cy$.

Watch Video Solution

14. The normals are drawn from $(2\lambda, 0)$ to the parabola $y^2 = 4x$ .Show that λ must be greater than 1. One normal is always the X-axis. Find λ for which the other two normals are perpendicular to each other.

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15. If m_1, m_2 are the slopes of the two tangents that are drawn from (2,3) to the parabola $y^2 = 4x$, then the value of $\frac{1}{m_1} + \frac{1}{m_2}$ is

A. -3

B. 3

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: B

Watch Video Solution

16. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x - a)$ is

A. 90°

B. 30°

C. $\tan^{-1}\left(\frac{1}{2}\right)$

D. 45°

Answer: A

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17. IF (a,b) is the mid point of chord passing through the vertex of the parabola $y^2 = 4x$, then

A. a=2b

B. 2a=b

C. $a^2 = 2b$

D. $2a = b^2$

Answer: D

Watch Video Solution

18. The diameter of the parabola $y^2 = 6x$ corresponding to the system of parallel chords 3x-y+c=0 is

A. y-1=0

B. y-2=0

C. y+1=0

D. y+2=0

Answer: A

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19. Tangents are drawn from the point (-1, 2) to the parabola $y^2 = 4x$ The area of the triangle for tangents and their chord of contact is

A. 8

B. $8\sqrt{3}$

C. $8\sqrt{2}$

D. None of these

Answer: C

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20. for parabola $x^2 + y^2 + 2xy - 6x - 2y + 3 = 0$, the focus is (a)(1,-1)(b)(-1,1)(c)(3,1)` (d) None of these

A. (1,-1)

B. (-1,1)

C. (3,1)

D. None of these

Answer: C

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21. Find the locus of the mid-points of the chords of the parabola $y^2 = 4ax$ which subtend a right angle at vertex of the parabola.

A. $y^2 - 2ax + 8a^2 = 0$

B. $y^2 = a(x - 4a)$

C. $y^2 = 4a(x - 4a)$

D. $y^2 + 3ax + 4a^2 = 0$

Answer: A

Watch Video Solution

22. 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. (-1,2)

C. (0,2)

D. (2,0)

Answer: C

Watch Video Solution

23. The locus of the point of intersection of the tangents to the parabola $y^2 = 4ax$ which include an angle α is

Watch Video Solution

24. The lacus of the middle points of the chords of the parabola $y^2 = 4ax$ which pass through the facus, is

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25. Tangents are drawn from the point (-1, 2) to the parabola $y^2 = 4x$ The area of the triangle for tangents and their chord of contact is

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Exercise Single Option Correct Type Questions

1. A common tangent is drawn to the circle $x^2 + y^2 = a^2$ and the parabola $y^2 = 4bx$. If the angle which his tangent makes with the axis of x is $\frac{\pi}{4}$, then the relationship between a and b (a,b $>$ 0)

A. $b = \sqrt{2}a$

B. $a = b\sqrt{2}$

C. c=2a

D. a=2c

Answer: A

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2. The equation of parabola whose vertex and focus lie on the axis of x at distances a and a_1 from the origin respectively, is

A. $y^2 = 4(a_1 - a)x$

B. $y^2 = 4(a_1 - a)(x - a)$

C. $y^2 = 4(a_1 - a)(x - a_1)$

D. $y^2 = 4aa_1x$

Answer: B

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3. If parabolas $y^2 = \lambda x$ and $25\left[(x-3)^2 + (y+2)^2\right] = (3x - 4y - 2)^2$ are equal, then the value of λ is

A. 3

B. 6

C. 7

D. 9

Answer: B

Watch Video Solution

4. 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

of $\frac{FG}{BC}$ is:

A. $\frac{\sqrt{3}+1}{4}$

B. $\frac{\sqrt{3}+1}{2}$

C. $\frac{\sqrt{5}+1}{4}$

D. $\frac{\sqrt{5}+1}{2}$

Answer: D

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5. 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. $\cot^2\theta$

C. $\tan^3\theta$

D. $\cot^3\theta$

Answer: D

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6. The vertex of the parabola whose parametric equation is $x = t^2 - t + 1, y = t^2 + t + 1; t \in R,$ is

A. (1,1)

B. (2,2)

C. (3,3)

D. $\left(\frac{1}{2}, \frac{1}{2}\right)$

Answer: A

Watch Video Solution

7. The circle $x^2 + y^2 + 2\lambda x = 0, \lambda \in R,$ touches the parabola $y^2 = 4x$ externally. Then,

A. $p > 0$

B. $p < 0$

C. $p > 1$

D. $p > 2$

Answer: A

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8. If $a \neq 0$ and the line $2bx + 3cy + 4d = 0$ passes through the points of intersection of the parabola $y^2 = 4ax$ and $x^2 = 4ay$, then

A. $d^2 + (2b + 3c)^2 = 0$

B. $d^2 + (3b + 2c)^2 = a^2$

C. $d^2 + (2b - 3c)^2 = 0$

D. $d^2 + (2b + 3c)^2 = a^2$

Answer: A

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9. 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 passes through these two points. The length of a tangent from the origin to the circle is: $\sqrt{\frac{bc}{a}}$ (b) ac^2 (d) $\sqrt{\frac{c}{a}}$

A. $\sqrt{\frac{bc}{a}}$

B. ac^2

C. $\frac{b}{a}$

D. $\sqrt{\frac{c}{a}}$

Answer: D

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10. Two mutually perpendicular tangents of the parabola $y^2 = 4ax$ meet the axis at P_1 and P_2. If S is the focal of the parabola, Then $\frac{1}{SP_1} + \frac{1}{SP_2}$ is equal to

A. $\frac{1}{4a}$

B. $\frac{1}{a}$

C. $\frac{2}{a}$

D. $\frac{4}{a}$

Answer: B

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11. If the normals to the parabola $y^2 = 4ax$ at P meets the curve again at Q and if PQ and the normal at Q make angle

α and β , respectively, with the x-axis, then $tan\alpha(\tan\alpha + \tan\beta)$ has the value equal to 0 (b) -2 (c) $-\frac{1}{2}$ (d) -1

A. -2

B. -1

C. $-\frac{1}{2}$

D. 0

Answer: A

Watch Video Solution

12. If the normals at P, Q, R of the parabola $y^2 = 4ax$ meet in O and S be its focus, then prove that $. SP. SQ. SR = a. (SO)^2.$

A. $(SA)^2$

B. $(SA)^3$

C. $a(SA)^2$

D. $a(SA)^3$

Answer: C

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13. Length of the shortest normal chord of the parabola $y^2 = 4ax$ is

A. $2a\sqrt{27}$

B. 9a

C. $a\sqrt{54}$

D. 18a

Answer: A

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14. The largest value of a for which the circle $x^2 + y^2 = a^2$ falls totally in the interior of the parabola $y^2 = 4(x + 4)$ is

(A) $4\sqrt{3}$ (B) 4 (C) $4\frac{\sqrt{6}}{7}$ (D) $2\sqrt{3}$

A. $4\sqrt{3}$

B. 4

C. $\frac{4\sqrt{6}}{7}$

D. $2\sqrt{3}$

Answer: D

Watch Video Solution

15. From a point $(\sin\theta, \cos\theta)$, if three normals can be drawn to the parabola $y^2 = 4ax$ then the value of a is

A. $\left(\frac{1}{2}, 1\right)$

B. $\left[-\frac{1}{2}, 0\right)$

C. $\left[\frac{1}{2}, 1\right]$

D. $\left(-\frac{1}{2}, 0\right) \cup \left(0, \frac{1}{2}\right)$

Answer: D

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16. If two different tangents of $y^2 = 4x$ are the normals to $x^2 = 4by,$ then

A. $|b| < \frac{1}{2\sqrt{2}}$

B. $|b| < \frac{1}{\sqrt{2}}$

C. $|b| > \frac{1}{2\sqrt{2}}$

D. $|b| > \frac{1}{\sqrt{2}}$

Answer: A

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17. The shortest distance between the parabolas $2y^2 = 2x - 1$ and $2x^2 = 2y - 1$ is $2\sqrt{2}$ (b) $\frac{1}{2}\sqrt{2}$ (c) 4 (d) $\sqrt{\frac{36}{5}}$

A. $\frac{1}{2\sqrt{2}}$

B. $\frac{1}{2}$

C. $2\sqrt{2}$

D. 4

Answer: A

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18. Normals at two points (x_1, x_2) and (x_2, y_2) of the parabola $y^2 = 4x$ meet again on the parabola, where $x_1 + x_2 = 4$, then $|y_1 + y_2|$ is equal to

A. $\sqrt{2}$

B. $2\sqrt{2}$

C. $4\sqrt{2}$

D. $8\sqrt{2}$

Answer: C

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19. A line is drawn from A(-2,0) to intersect the curve $y^2 = 4x$ in P and Q in the first quadrant such that $\frac{1}{AP} + \frac{1}{AQ} < \frac{1}{4}$, then slope of the line always be :

A. $< \frac{1}{\sqrt{3}}$

B. $> \frac{1}{\sqrt{3}}$

C. $> \sqrt{2}$

D. $> \sqrt{3}$

Answer: D

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20. An equilateral triangle SAB in inscribed in the parabola $y^2 = 4ax$ having it's focus at S. If chord lies towards the left of S, then the side length of this triangle is

A. $a - \left(2 - \sqrt{3}\right)$

B. $2a\left(2 - \sqrt{3}\right)$

C. $4a\left(2 - \sqrt{3}\right)$

D. $8a\left(2 - \sqrt{3}\right)$

Answer: C

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

A. $(0, \infty)$

B. $\left(0, \frac{1}{2}\right)$

C. $\left(\frac{1}{4}, \frac{1}{2}\right)$

D. $\left(\frac{1}{2}, \infty\right)$

Answer: D

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22. Let S be the focus of $y^2 = 4x$ and a point P be moving on the curve such that its abscissa is increasing at the rate of 4 units/s. Then the rate of increase of the projection of SP on $x + y = 1$ when P is at (4, 4) is $\sqrt{2}$ (b) -1 (c) $-\sqrt{2}$ (d) $-\frac{3}{\sqrt{2}}$

A. $-\sqrt{2}$

B. $-\frac{3}{\sqrt{2}}$

C. -1

D. $\sqrt{2}$

Answer: A

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23. If P be a point on the parabola $y^2 = 3(2x - 3)$ and M is the foot of perpendicular drawn from the point P on the directrix of the parabola, then length of each sides of an equilateral triangle SMP(where S is the focus of the parabola), is

A. 2

B. 4

C. 6

D. 8

Answer: C

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24. Consider the parabola $y^2 = 4x$. Let $A \equiv (4, -4)$ and $B \equiv (9, 6)$ be two fixed points on the parabola. Let C be a moving point on the parabola between $AandB$ such that the area of the triangle ABC is maximum. Then the coordinates of C are $\left(\frac{1}{4}, 1\right)$ (b) $(4, 4)$ $\left(3, \frac{2}{\sqrt{3}}\right)$ (d) $(3, -2\sqrt{3})$

A. $\left(\frac{1}{4}, 1\right)$

B. $(3, -2\sqrt{3})$

C. $(3, 2\sqrt{3})$

D. (4,4)

Answer: A

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25. Through the vertex O of the parabola $y^2 = 4ax$, two chords $OPandOQ$ are drawn and the circles on OP and OQ as diameters intersect at R. If θ_1, θ_2 , and φ are the angles made with the axis by the tangents at P and Q on the parabola and by OR, then value of $\cot\theta_1 + \cot\theta_2$ is $-2\tan\varphi$ (b) $-2\tan(\pi - \varphi)$ 0 (d) $2\cot\varphi$

A. $-2\tan\phi$

B. $2\tan\phi$

C. 0

D. $2\cot\phi$

Answer: A

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26. AB is a double ordinate of the parabola $y^2 = 4ax$. Tangents drawn to the parabola at A and B meet the y-axis at A_1 and B_1, respectively. If the area of trapezium AA_1B_1B is equal to $12a^2$, then the angle subtended by A_1B_1 at the focus of the parabola is equal to

A. $\tan^{-1} 2$

B. $\tan^{-1} 3$

C. $2\tan^{-1} 2$

D. $2\tan^{-1} 3$

Answer: C

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27. If the fourth term in the expansion of $\left(px + \frac{1}{x}\right)^n$ is $\frac{5}{2}$, then $(n, p) =$

A. q=p

B. $q > p$

C. $q < p$

D. pq=1

Answer: D

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28. The set of points on the axis of the parabola $y^2 - 4x - 2y + 5 = 0$ from which all the three normals to the parabola are real , is

A. $(k, 0), k > 1$

B. $(k, 1), k > 3$

C. $(k, 2), k > 6$

D. $(k, 3), k > 8$

Answer: B

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29. The tangent to the parabola $y = x^2$ has been drawn so that the abscissa x_0 of the point of tangency belongs to the interval [1,2]. Find x_0 for which the triangle bounded by the tangent, the axis of ordinates, and the straight line $y = x02$ has the greatest area.

A. 0

B. 1

C. 2

D. 3

Answer: C

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30. if $y = 4x + 3$ is parallel to a tangent to the parabola $y^2 = 12x$, then its distance from the normal parallel to the given line is

A. $\frac{4}{\sqrt{5}}$

B. $\frac{12}{\sqrt{5}}$

C. $\frac{\sqrt{5}}{4}$

D. $\frac{\sqrt{5}}{12}$

Answer: D

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Exercise More Than One Correct Option Type Questions

1. Equation of the common tangent of a circle $x^2 + y^2 = 50$ and the parabola $y^2 = 40x$ can be

A. x+y-10=0

B. x-y+10=0

C. x+y+10=0

D. x-y-10=0

Answer: B::C

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2. Let PQ be a chord of the parabola $y^2 = 4x$. A circle drawn with PQ as a diameter passes through the vertex V of theparabola. If $ar(\Delta PVQ) = 20$ sq unit then the coordinates of P are

A. (16,8)

B. (16,-8)

C. (-16,8)

D. (-16,-8)

Answer: A::B

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3. Let $y^2 = 4ax$ be a parabola and $x^2 + y^2 + 2bx = 0$ be a circle. If parabola and circle touch each externally then:

A. $a > 0, b < 0$

B. $a > 0, b > 0$

C. $a < 0, b > 0$

D. $a < 0, b < 0$

Answer: B::D

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4. Tangent is drawn at any point (x_1, y_1) other than the vertex on the parabola $y^2 = 4ax$. If tangents are drawn from any point on this tangent to the circle $x^2 + y^2 = a^2$ such that all the chords of contact pass through a fixed point (x_2, y_2), then $x_1 a, x_2$ in GP (b) $\frac{y_1}{2}, a, y_2$ are in GP $-4, \frac{y_1}{y_2}, x_1 / x_2$ are in GP (d) $x_1 x_2 + y_1 y_2 = a^2$

A. x_1, a, x_2 are in GP

B. $\frac{y_1}{2}, a, y_2$ are in GP

C. $-4, \frac{y_1}{y_2}, \frac{x_1}{x_2}$ are in GP

D. $x_1 x_2 + y_1 y_2 = a^2$

Answer: B::C::D

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5. Let P , Q and R are three co-normal points on the parabola $y^2 = 4ax$. Then the correct statement(s) is /at

A. algebraic sum of the slopes of the normals at P,Q and R vanishes

B. algebraic sum of the ordinates of the points P,Q and R vanishes

C. centeroid of the traingle PQR lies on the axis of the parabola

D. Circle cicrcumscribing the traingle PQR passes through the vertex of the parabola.

Answer: A::B::C::D

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6. Let P be a point whose coordinates differ by unity and the point does not lie on any of the axes of reference. If the parabola $y^2 = 4x + 1$ passes through $P,$ then the ordinate of P may be 3 (b) -1 (c) 5 (d) 1

A. 3

B. -1

C. 5

D. 1

Answer: A::C

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7. If a point P on y^2x, the foot of the perpendicular from P on the directrix and the focus form an equilateral traingle , then the coordinates of P may be

A. $(3, -2\sqrt{3})$

B. $(-3, 2\sqrt{3})$

C. $(3, 2\sqrt{3})$

D. $(-3, -2\sqrt{3})$

Answer: A::C

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8. The locus of foot of the perpendiculars drawn from the vertex on a variable tangent to the parabola $y^2 = 4ax$ is

A. the directrix

B. the tangent at the vertex

C. x=a

D. x=0

Answer: B::D

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9. The extremities of latusrectum of a parabola are (1,1) and (1,-1) . Then the equation of the parabola can be

A. $y^2 = 2x - 1$

B. $y^2 = 1 - 2x$

C. $y^2 = 2x - 3$

D. $y^2 = 2x - 4$

Answer: A::C

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10. If from the vertex of a parabola $y^2 = 4x$ a pair of chords be drawn at right angles to one another andwith these chords as adjacent sides a rectangle be made, then the locus of the further end of the rectangle is

A. an equal parabola

B. a parabola with focus at (8a,0)

C. a parabola with directrix as x-7a=0

D. not a parabola

Answer: A::C

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11. If two chords drawn from the point $A(4, 4)$ to the parabola $x^2 = 4y$ are bisected by the line $y = mx$, the interval in which m lies is

A. $m \in (-\infty, -\sqrt{3})$

B. $m \in (-\infty, -\sqrt{3} - 1)$

C. $m \in (\sqrt{3}, \infty)$

D. $m \in (\sqrt{3} - 1, \infty)$

Answer: B::C::D

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12. Through a point $P(-2, 0)$, tangerts PQ and PR are drawn to the parabola $y^2 = 8x$. Two circles each passing through the focus of the parabola and one touching at Q and other at R are drawn. Which of the following point(s) with respect to the triangle PQR lie(s) on the radical axis of the two circles?

A. centroid

B. orthocentre

C. incentre

D. circumcentre

Answer: A::B::C::D

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13. The set of points on the axis of the parabola $(y-2)^2 = 4\left(x - \frac{1}{2}\right)$ from which three distinct normals can be drawn to the parabola are

A. (3,2)

B. (1,2)

C. (4,2)

D. (5,2)

Answer: A::C::D

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14. Three normals are drawn from the point $(14, 7)$ to the curve $y^2 - 16x - 8y = 0$. Find the coordinates of the feet of the normals.

A. (3,-4)

B. (8,16)

C. (0,0)

D. (2,2)

Answer: A::B::C

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15. A quadrilateral is inscribed in a parabola . Then,

A. the quadrilateral may be cyclic

B. diagonals of the quadrilateral may be equal

C. all possible pairs of adjacent sides may be perpendicular

D. None of the above

Answer: A::B

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Exercise Passage Based Questions

1. Consider a parabola P touches coordinate axes at (4,0) and (0,3).

if focus of parabola P is (a,b) then the value of b-a is

A. $\frac{1}{25}$

B. $\frac{3}{25}$

C. $\frac{4}{25}$

D. $\frac{12}{25}$

Answer: D

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2. Consider a parabola P touches coordinate axes at (4,0) and (0,3).

Length of latus rectum of parabola P is

A. $\frac{72}{125}$

B. $\frac{144}{125}$

C. $\frac{288}{125}$

D. $\frac{576}{125}$

Answer: D

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3. Consider a parabola P touches coordinate axes at (4,0) and (0,3).

Equation of directrix of parabola P is

A. 4x+3y=0

B. 3x+4y=12

C. 3x+4y=0

D. 4x+3y=12

Answer: C

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4. Let C be the locus of the circumcentre of a variable traingle having sides Y-axis ,y=2 and ax+by=1, where (a,b) lies on the parabola $y^2 = 4\lambda x$.

For $\lambda = 2$, the product of coordinates of the vertex of the curve C is

A. -8

B. -6

C. 6

D. 8

Answer: B

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5. Let C be the locus of the circumcentre of a variable traingle having sides Y-axis ,y=2 and ax+by=1, where (a,b) lies on the parabola $y^2 = 4\lambda x$.

For $\lambda = \frac{1}{32}$, the length of smallest focal chord of the curve C is

A. $\frac{8}{3}$

B. 2

C. 4

D. 8

Answer: C

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6. The locus of the circumcenter of a variable triangle having sides the y-axis, y=2, and lx+my=1, where (1,m) lies on the parabola $y^2 = 4x$, is a curve C.

The curve C is symmetric about the line

A. $x = -\frac{3}{2}$

B. $y = -\frac{3}{2}$

C. $x = \frac{3}{2}$

D. $y = \frac{3}{2}$

Answer: D

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7. Consider a parabola

$$x^2 - 4xy + 4y^2 - 32x + 4y + 16 = 0.$$

The focus of the parabola (P) is

A. (2,1)

B. (-2,1)

C. (-2,-1)

D. (2,-1)

Answer: D

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8. Consider a parabola

$$x^2 - 4xy + 4y^2 - 32x + 4y + 16 = 0.$$

The focus of the parabola (P) is

A. $\frac{3}{\sqrt{5}}$

B. $\frac{6}{\sqrt{5}}$

C. $\frac{12}{\sqrt{5}}$

D. $\frac{24}{\sqrt{5}}$

Answer: C

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9. Consider a parabola $x^2 - 4xy + 4y^2 - 32x + 4y + 16 = 0.$

The focus of the parabola (P) is

A. x-2y-4=0

B. 2x+y-3=0

C. x-2y+4=0

D. 2x+y+3=0

Answer: D

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10. If l and m are variable real number such that $5l^2 + 6m^2 - 4lm + 3l = 0$, then the variable line lx+my=1

always touches a fixed parabola, whose axes is parallel to the x-axis.

The directrix of the parabola is

A. 2

B. 3

C. 4

D. 5

Answer: B

Watch Video Solution

11. IF l and m are variable real numbers such that $5l^2 - 4lm + 6m^2 + 3l = 0$, then the variable line lx+my=1 always touches a fixed parabola, whose axis is parallel to the

X-axis.

If (c,d) is the focus of the parabola , then the value of $2^{|d-c|}$ is

A. 1

B. 2

C. 4

D. 8

Answer: B

View Text Solution

12. IF l and m are variable real numbers such that $5l^2 - 4lm + 6m^2 + 3l = 0$, then the variable line lx+my=1 always touches a fixed parabola, whose axis is parallel to the

X-axis.

If ex+f=0 is directrix of the parabola and e,f are prime numbers , then the value of $|e-f|$ is

A. 2

B. 4

C. 6

D. 8

Answer: D

View Text Solution

13. C_1 is a curve $y^2=4x$, C_2 is curve obtained by rotating $C_1, 120^\circ$ in anti -clockwise direction C_3 is reflection of C_2 with respect to y=x and S_1, S_2, S_3 are foci of C_1, C_2 and C_3,

respectively, where O is origin.

If $(t^2, 2t)$ are parametric form of curve C_1, then the parametric form of curve C_2 is

A. $= \left(\frac{1}{2}(t^2 + 2\sqrt{3}t), \frac{1}{2}(\sqrt{3}t^2 + 2t)\right)$

B. $= \left(\frac{1}{2}(-t^2 + 2\sqrt{3}t), \frac{1}{2}(\sqrt{3}t^2 + 2t)\right)$

C. $= \left(\frac{1}{2}(-t^2 + 2\sqrt{3}t), \frac{1}{2}(-\sqrt{3}t^2 + 2t)\right)$

D. $= \left(\frac{1}{2}(-t^2 + 2\sqrt{3}t), \frac{1}{2}(-\sqrt{3}t^2 - 2t)\right)$

Answer: D

Watch Video Solution

14. C_1 is a curve $y^2 = 4x$, C_2 is curve obtained by rotating $C_1, 120^\circ$ in anti -clockwise direction C_3 is reflection of C_2 with respect to y=x and S_1, S_2, S_3 are foci of C_1, C_2 and C_3,

respectively, where O is origin.

Area of ΔOS_2S_3 is

A. $\frac{1}{8}$

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. 1

Answer: B

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15. C_1 is a curve $y^2 = 4x$, C_2 is curve obtained by rotating C_1, 120° in anti -clockwise direction C_3 is reflection of C_2 with respect to y=x and S_1, S_2, S_3 are foci of C_1, C_2 and C_3, respectively, where O is origin.

IF $S_1(x_1, y_2), S_2(x_2, y_2)$ and $S_3(x_3, y_3)$ then the value of $\sum x_1^2 + \sum y_1^2$ is

A. 2

B. 3

C. 4

D. 5

Answer: B

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16. Tangent to the parabola $y = x^2 + ax + 1$ at the point of intersection of the y-axis also touches the circle $x^2 + y^2 = r^2$. Also, no point of the parabola is below the x-

axis.

The radius of circle when a attains its maximum value is

A. 1

B. 3

C. 5

D. 7

Answer: A

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17. Tangent to the parabola $y = x^2 + ax + 1$ at the point of intersection of the y-axis also touches the circle $x^2 + y^2 = r^2$. Also, no point of the parabola is below the x-

axis.

The radius of circle when a attains its maximum value is

A. -1

B. 0

C. 1

D. 2

Answer: B

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18. Tangent to the parabola $y = x^2 + ax + 1$ at the point of intersection of the y-axis also touches the circle $x^2 + y^2 = r^2$. Also, no point of the parabola is below the x-axis.

The minimum area bounded by the tangent and the coordinate axes is

A. 1

B. 2

C. 4

D. 8

Answer: B

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19. A parabola (P) touches the conic $x^2 + xy + y^2 - 2x - 2y + 1 = 0$ at the points when it is cut by the line x+y+1=0.

IF equation of parabola (P) is

$ax^2 + by^2 + 2hxy + 2gx + 2fy + c = 0$, then the value of $|a + b + c + f + g + h|$ is

A. 8

B. 10

C. 12

D. 14

Answer: C

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20. A parabola (P) touches the conic $x^2 + xy + y^2 - 2x - 2y + 1 = 0$ at the points when it is cut by the line x+y+1=0.

The length of latusrectum of parabola (P) is

A. $\sqrt{2}$

B. $3\sqrt{2}$

C. $5\sqrt{2}$

D. $7\sqrt{2}$

Answer: D

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21. A parabola (P) touches the conic $x^2 + xy + y^2 - 2x - 2y + 1 = 0$ at the points when it is cut by the line x+y+1=0.

If (a,b) is the vertex of the parabola (P), then the value of $|a - b|$ is

A. 0

B. $\frac{1}{2}$

C. 1

D. $\frac{3}{2}$

Answer: A

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22. y=3x is tangent to the parabola $2y = ax^2 + b$. The minimum value of a+b is

A. 2

B. 4

C. 6

D. 8

Answer: C

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23. y=3x is tangent to the parabola $2y = ax^2 + ab$.

If (2,6) is the point of contact , then the value of 2a is

A. 2

B. 3

C. 4

D. 5

Answer: B

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24. y=3x is tangent to the parabola $2y = ax^2 + ab$.

If b=18,then the point of contact is

A. (1,3)

B. (2,6)

C. (3,9)

D. (6,18)

Answer: D

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Exercise Single Integer Answer Type Questions

1. Two tangent are drawn from the point $(-2, -1)$ to parabola $y^2 = 4x$. if α is the angle between these tangents, then find the value of $\tan\alpha$.

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2. If the distances of two points P and Q from the focus of a parabola $y^2 = 4x$ are 4 and 9,respectively, then the distance of the point of intersection of tangents at P and Q from the focus is

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3. The tangents and normals are drawn at the extremites of the latusrectum of the parabola $y^2 = 4x$. The area of

quadrilateral so formed is λsq units, the value of λ is

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4. Three normals are drawn from the point (a,0) to the parabola $y^2 = x$. One normal is the X-axis . If other two normals are perpendicular to each other , then the value of 4a is

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5. AB is a chord of the parabola $y^2 = 4ax$ with its vertex at A. BC is drawn perpendicular to AB meeting the axis at C.The projecton of BC on the axis of the parabola is

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6. The parabolas $y = x^2 - 9$ and $y = \lambda x^2$ intersect at points A and B. If length of AB is equal to 2a and if $\lambda a^2 + \mu = a^2$, then the value of μ is

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7. Let n be the number of integral points lying inside the parabola $y^2 = 8x$ and circle $x^2 + y^2 = 16$, then the sum of the digits of number n is

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

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9. If the circle $(x-6)^2+y^2=r^2$ and the parabola $y^2=4x$ have maximum number of common chords, then the least integral value of r is _____ .

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10. The slope of line which belongs to family (1+ l) x + (1-l)y + 2(1-l) = 0 and makes shortest intercept on $x^2=4y-4$

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Exercise Statement I And Ii Type Questions

1. Statement I the equation of the common tangent to the parabolas $y^2 = 4x$ and $x^2 = 4y$ is x+y+1=0.

Statement II Both the parabolas are reflected to each other about the line y=x.

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.

Answer: A

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2. Statement I two perpendicular normals can be drawn from the point $\left(\frac{5}{2}, -2\right)$ to the parabola $(y+1)^2 = 2(x-1)$.

Statement II two perpendicular normals can be drawn from the point (3a,0) to the parabola $y^2 = 4ax$.

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.

Answer: A

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3. Statement I The line $y = mx + \frac{a}{m}$ is tangent to the parabola $y^2 = 4ax$ for all values of m.

Statement II A straight line y=mx+c intersects the parabola $y^2 = 4ax$ one point is a tangent line.

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.

Answer: A

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4. Statement I : The conic $\sqrt{a}x + \sqrt{b}y = 1$ represents a parabola. Statement II : Conic $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola, if $h^2 = ab$.

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 false, Statement II is false.

D. Statement I is false,Statement II is true.

Answer: C

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5. Statement I The lines from the vertex to the two extremities of a focal chord of the parabola $y^2 = 4ax$ are perpendicular to each other.

Statement II If extremities of focal chord of a parabola are $\left(at_1^2, 2at_1\right)$ and $\left(at_2^2, 2at_2\right)$, then $t_1 t_2 = -1$.

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.

Answer: D

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6. Statement 1: The length of focal chord of a parabola $y^2 = 8x$ mkaing on angle of 60^0 with the x-axis is 32. Statement 2: The length of focal chord of a parabola $y^2 = 4ax$ making an angle with the x-axis is $4a \cos ec^2 \alpha$

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.

Answer: C

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7. Statement I Straight line $x + y = \lambda$ touch the parabola $y = x - x^2$, if k=1.

Statement II Discriminant of $(x - 1)^2 = x - x^2$ is zero.

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.

Answer: C

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8. Statement I Length of latusrectum of parabola $(3x + 4y + 5)^2 = 4(4x + 3y + 2)$ is 4. Statement II Length of latusrectum of parabola $y^2 = 4ax$ is 4a.

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.

Answer: D

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Exercise Subjective Type Questions

1. If a tangent to the parabola $y^2 = 4ax$ meets the axis of the parabola in T and the tangent at the vertex A in Y, and the rectangle $TAYG$ is completed, show that the locus of G is $y^2 + ax = 0$.

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2. IF incident ray from point (-1,2) parallel to the axis of the parabola $y^2 = 4x$ strikes the parabola, find the equation of the reflected ray.

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3. Prove that the normal chord to a parabola at the point whose ordinate is equal to the abscissa subtends a right angle at the focus.

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4. Find the shortest distance between the parabola $y^2 = 4x$ and circle $x^2 + y^2 - 24y + 128 = 0$.

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5. Show that the locus of a point that divides a chord of slope 2 of the parabola $y^2 = 4x$ internally in the ratio $1:2$ is parabola. Find the vertex of this parabola.

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6. if the locus of inter section of tangents to the parabola $y^2 = 4ax$ which intercept a fix length 'l' on the directrix is $(y^2 - \lambda ax)(x + a)^2 = l^2x^2$ then find the value of λ

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7. Through the vertex O of the parabola $y^2 = 4ax$, two chords $OPandOQ$ are drawn and the circles on OP and OQ as diameters intersect at R. If θ_1, θ_2 , and φ are the angles made with the axis by the tangents at P and Q on the parabola and by OR, then value of $\cot\theta_1 + \cot\theta_2$ is $-2\tan\varphi$ (b) $-2\tan(\pi - \varphi)$ 0 (d) $2\cot\varphi$

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8. Three normals with slopes m_1, m_2 and m_3 are down from a point P not on the axis of the axis of the parabola $y^2 = 4x$. If $m_1 m_2$ = α, results in the locus of P being a part of parabola, Find the value of α

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9. If the locus of centres of a family of circles passing through the vertex of the parabola $y^2 = 4ax$ and cutting the parabola orthogonally at the other point of intersection is $2y^2\left(2y^2 + x^2 - 12ax\right) = ax(kx - 4a)^2$,then find the value of k.

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10. TP and TQ are tangents to parabola $y^2 = 4x$ and normals at P and Q intersect at a point R on the curve. The locus of the centre of the circle circumseribing ΔTPQ is a parabola whose

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11. A family of chords of the parabola $y^2 = 4ax$ is drawn so that their projections on a straight line inclined equally to both the axes are all of a constant length c, prove that the locus of their middle points is the curve $(y^2 - 4ax)(y + 2a)^2 + 2a^2c^2 = 0.$

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12. The normals at P,Q and R are concurrent and PQ meets the diameter through R on the directrix x=-a . Prove that PQ touches [or PQ enveleopes] the parabola $y^2 + 16a(x + a) = 0.$

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13. IF the normals to the parabola $y^2 = 4ax$ at three points P,Q and R meets at A and S be the focus , prove that SP.SQ.SR=$a(SA)^2$.

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14. From a pt A common tangents are drawn to a circle $x^2 + y^2 = \frac{a^2}{2}$ and $y^2 = 4ax$. Find the area of the quadrilateral formed by common tangents, chord of contact of circle and chord of contact of parabola.

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15. Prove that any three tangents to a parabola whose slopes are in harmonic progression enclose a triangle of constant area.

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Exercise Questions Asked In Previous 13 Years Exam

1. Tangent to the curve $y = x^2 + 6$ at a point $(1, 7)$ touches the circle $x^2 + y^2 + 16x + 12y + c = 0$at a point Q, then the coordinates of Q are (A) $(-6, -11)$ (B) $(-9, -13)$ (C) $(-10, -15)$ (D) $(-6, -7)$

A. (-6,-11)

B. (-9,-13)

C. (-10,-15)

D. (-6,-7)

Answer: D

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2. let P be the point $(1, 0)$ and Q be a point on the locus $y^2 = 8x$. The locus of the midpoint of PQ is

A. $x^2 - 4y + 2 = 0$

B. $x^2 + 4y + 2 = 0$

C. $y^2 + 4y + 2 = 0$

D. $y^2 - 4y + 2 = 0$

Answer: D

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3. The axis of parabola is along the line y=x and the distance of its vertex and focus from origin are $\sqrt{2}$ and $2\sqrt{2}$ respectively. If 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. $(x-y)^2 = 8(x+y-2)$

Answer: D

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4. The equations of the common tangents to the parabola $y = x^2$ and $y = -(x-2)^2$ is/are :

A. y=4(x-1)

B. y=0

C. y=-4(x-1)

D. y=-30x-50

Answer: A::B

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

A. $xy = \frac{105}{64}$

B. $xy = \frac{3}{4}$

C. $xy = \frac{35}{16}$

D. $xy = \frac{64}{105}$

Answer: A

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6. Angle between the tangents to the curve $y = x^2 - 5x + 6$ at the points (2,0) and (3,0) is

A. $\pi/3$

B. $\pi/2$

C. $\pi/6$

D. $\pi/4$

Answer: B

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7. Consider the circle $x^2 + y^2 = 9$ and the parabola $y^2 = 8x$. They intersect at P and Q in first and 4th quadrant,respectively. Tangents to the circle at P and Q intersect the x-axis at R and tangents at the parabola at P and Q intersect the x-axis at S.

A. $1:\sqrt{2}$

B. $1:2$

C. $1:4$

D. $1:8$

Answer: C

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8. Consider the circle $x^2+y^2=9$ and the parabola $y^2=8x$. They intersect at P and Q in first and 4th quadrant,respectively. Tangents to the circle at P and Q intersect the x-axis at R and tangents at the parabola at P and Q intersect the x-axis at S.

A. 5

B. $3\sqrt{3}$

C. $3\sqrt{2}$

D. $2\sqrt{3}$

Answer: B

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9. Consider the circle $x^2 + y^2 = 9$ and the parabola $y^2 = 8x$. They intersect at P and Q in first and 4th quadrant,respectively. Tangents to the circle at P and Q intersect the x-axis at R and tangents at the parabola at P and Q intersect the x-axis at S.

A. 4

B. 3

C. $8/3$

D. 2

Answer: D

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10. Statement I The curve $y = \frac{x^2}{2} + x + 1$ is symmetric with respect to the line $x = 1$. because 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 corrected explanation for Statement I

C. Statement is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: A

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11. The equation of a tangent to the parabola $y^2 = 8xisy = x + 2$. The point on this line from which the other tangent to the parabola is perpendicular to the given tangent is (1) $(-1, 1)$ (2) $(0, 2)$ (3) $(2, 4)$ (4) $(-2, 0)$

A. (-1,1)

B. (0,2)

C. (2,4)

D. (-2,0)

Answer: D

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12. Consider the two curves C_1 ; $y^2 = 4x$, C_2 : $x^2 + y^2 - 6x + 1 = 0$ 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

Answer: B

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13. A parabola has the origin as its focus and the line x=2 as the directrix. The vertex of the parabola is at

A. $(0, 2)$

B. $(1, 0)$

C. $(0, 1)$

D. $(2, 0)$

Answer: B

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14. The tangent PT and the normal PN to the parabola $y^2 = 4ax$ at a point P on it meet its axis at points T and N, respectively. The locus of the centroid of the triangle PTN is a parabola whose:

A. vertex is $\left(\frac{2a}{3}, 0\right)$

B. directrix is at x=0

C. latusrectum is $\frac{2a}{3}$

D. focus is (a,0)

Answer: A::D

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15. Let A and B be two distinct points on the parabola $y^2 = 4x$. If the axis of the parabola touches a circle of radius r having AB as its diameter, then the slope of the line joining A and B can be (A) $-\frac{1}{r}$ (B) $\frac{1}{r}$ (C) $\frac{2}{r}$ (D) $-\frac{2}{r}$

A. $-\frac{1}{r}$

B. $\frac{1}{r}$

C. $\frac{2}{r}$

D. $-\frac{2}{r}$

Answer: C::D

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16. If two tangents drawn from a point P to the parabola y2 = 4x are at right angles, then the locus of P is (1) $2x + 1 = 0$ (2) $x = 1$ (3) $2x1 = 0$ (4) $x = 1$

A. 2x+1=0

B. x=-1

C. 2x-1=0

D. x=1

Answer: B

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17. Consider the parabola $y^2 = 8x$. Let Δ_1 be the area of the triangle formed by the end points of its latus rectum

and the point P($\frac{1}{2}$,2) on the parabola and Δ_2 be the area of the triangle formed by drawing tangents at P and at the end points of latus rectum. $\frac{\Delta_1}{\Delta_2}$ is :

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18. Let (x,y) be any point on the parabola $y^2 = 4x$. Let P be the point that divides the line segment from (0,0) and (x,y) n the ratio 1:3. Then the locus of P is :

A. $x^2 = y$

B. $y^2 = 2x$

C. $y^2 = x$

D. $x^2 = 2y$

Answer: C

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19. Let (x,y) be any point on the parabola $y^2 = 4x$. Let P be the point that divides the line segment from (0,0) and (x,y) n the ratio 1:3. Then the locus of P is :

A. y-x+3=0

B. y+3x-33=0

C. y+x-15=0

D. y-2x+12=0

Answer: A::B::D

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20. The shortest distance between line y-x=1 and curve $x = y^2$ is

A. $\frac{3\sqrt{2}}{8}$

B. $\frac{8}{3\sqrt{2}}$

C. $\frac{4}{\sqrt{3}}$

D. $\frac{\sqrt{3}}{4}$

Answer: A

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21. Let S be the focus of the parabola $y^2 = 8x$ and let PQ be the common chord of the circle $x^2 + y^2 - 2x - 4y = 0$ and

the given parabola. The area of the triangle PQS is -

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22. Let PQ be a focal chord of the parabola $y^2 = 4ax$. The tangents to the parabola at P and Q meet at point lying on the line

$y = 2x + a, a < 0.$

If chord PQ subtends an angle θ at the vertex of $y^2 = 4ax$, then $\tan\theta =$

A. $\frac{2}{3}\sqrt{7}$

B. $-\frac{2}{3}\sqrt{7}$

C. $\frac{2}{3}\sqrt{5}$

D. $-\frac{2}{3}\sqrt{5}$

Answer: D

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23. Let PQ be a focal chord of the parabola $y^2 = 4ax$ The tangents to the parabola at P and Q meet at a point lying on the line $y = 2x + a, a > 0$. Length of chord PQ is

A. 7a

B. 5a

C. 2a

D. 3a

Answer: B

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24. The slope of the line touching the parabolas $y^2 = 4x$ and $x^2 = -32y$ is

A. $1/8$

B. $2/3$

C. $1/2$

D. $3/2$

Answer: C

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25. The common tangents to the circle $x^2 + y^2 = 2$ and the parabola $y^2 = 8x$ touch the circle at P, Q andthe parabola

at R, S. Then area of quadrilateral $PQRS$ is

A. 3

B. 6

C. 9

D. 15

Answer: D

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26. Let a, r, s, t be non-zero real numbers. Let $P(at^2, 2at)$, Q, $R(ar^2, 2ar)$ and $S(as^2, 2as)$ be distinct points onthe parabola $y^2 = 4ax$. Suppose that PQ is the focal chord and lines QR and PK are parallel, where K isthe point (2a, 0). The value of r is

A. $-\frac{1}{t}$

B. $\frac{t^2+1}{t}$

C. $\frac{1}{t}$

D. $\frac{t^2-1}{t}$

Answer: D

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27. Let a, r, s, t be non-zero real numbers. Let $P\left(at^2, 2at\right), Q\left(ar^2, 2ar\right)$ and $S\left(as^2, 2as\right)$ be distinct points on the parabola $y^2 = 4ax$. Suppose that PQ is the focal chord and lines QR and PK are parallel, where K the point (2a,0).

If st=1, then the tangent at P and the normal at S to the parabola meet at a point whose ordinate is

A. $\frac{(t^2+1)^2}{2t^3}$

B. $\frac{a(t^2+1)^2}{2t^3}$

C. $\frac{a(t^2+1)^2}{t^3}$

D. $\frac{a(t^2+2)^2}{t^3}$

Answer: B

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28. Let O be the vertex and Q be any point on the parabola, $x^2 = 8y$. It the point P divides the line segment OQ

internally in the ratio 1 : 3, then the locus of P is : (1) $x^2 = y$ (2) $y^2 = x$ (3) $y^2 = 2x$ (4) $x^2 = 2y$

A. $x^2 = y$

B. $y^2 = x$

C. $y^2 = 2x$

D. $x^2 = 2y$

Answer: D

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29. Â·If the normals of the parabola $y^2 = 4x$ drawn at the end points of its latus rectum are tangents to the circle $(x-3)^2(y+2)^2 = r^2$, then the value of r^2 is

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30. Let the curve C be the mirror image of the parabola $y^2 = 4x$ with respect to the line $x + y + 4 = 0$. If A and B are the points of intersection of C with the line $y = -5$, then the distance between A and B is

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31. Let P and Q be distinct points on the parabola $y^2 = 2x$ such that a circle with PQ as diameter passes through the vertex O of the parabola. If P lies in the first quadrant and the area of the triangle ΔOPQ is 32 , then which of the following is (are) the coordinates of P?

A. $\left(4, 2\sqrt{2}\right)$

B. $(9, 3\sqrt{2})$

C. $\left(\frac{1}{4}, \frac{1}{\sqrt{2}}\right)$

D. $(1\sqrt{2})$

Answer: A::D

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32. Let P be the point on the parabola, $y^2 = 8x$ which is at a minimum distance from the centre C of the circle, $x^2 + (y + 6)^2 = 1$. Then the equation of the circle, passing through C and having its centre at P is : (1) $x^2 + y^2 - 4x + 8y + 12 = 0$ (2) $x^2 + y^2 - x + 4y - 12 = 0$ (3)

$x^2 + y^2 - \frac{x}{4} + 2y - 24 = 0$ (4)

$x^2 + y^2 - 4x + 9y + 18 = 0$

A. $x^2 + y^2 - 4x + 8y + 12 = 0$

B. $x^2 + y^2 - x + 4y - 12 = 0$

C. $x^2 + y^2 - \frac{x}{4} + 2y - 24 = 0$

D. $x^2 + y^2 - 4x + 9y + 18 = 0$

Answer: A

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33. The circle C1 : x2 + y2 = 3, with centre at O, intersects the parabola x2 = 2y at the point P in the first quadrant. Let the tangent to the circle C1 at P touches other two circles C2

and C3 at R2 and R3, respectively. Suppose C2 and C3 have equal radii 2 3 and centres Q2 and Q3, respectively.

A. $Q_2Q_3 = 12$

B. $R_2R_3 = 4\sqrt{6}$

C. area of ΔOR_2R_3 is $6\sqrt{2}$

D. area of ΔPQ_2Q_3 is $4\sqrt{2}$

Answer: A::B::C

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34. Let P be the point on parabola $y^2 = 4x$ which is at the shortest distance from the center S of the circle $x^2 + y^2 - 4x - 16y + 64 = 0$ let Q be the point on the circle dividing the line segment SP internally. Then

A. $SP = 2\sqrt{5}$

B. $SQ : QP = \left(\sqrt{5} + 1\right) : 2$

C. the x-intercept of the normal to the parabola at P is 6

D. the slope of the tangent to the circle at Q is $\frac{1}{2}$

Answer: A::C::D

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35. The radius of a circle, having minimum area, which touches the curve $y = 4 - x^2$ and the lines y=|x|, is

A. $4\left(\sqrt{2} + 1\right)$

B. $2\left(\sqrt{2} + 1\right)$

C. $2\left(\sqrt{2} - 1\right)$

D. $4\left(\sqrt{2}-1\right)$

Answer: D

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36. If a chord which is not a tangent, of the parabola $y^2 = 16x$ has the equation 2x+y=p, and mid-point (h, k), then which of the following is (are) possible value (s) of p, h and k?

A. $p = 2, h = 3, k = -4$

B. $p = -1, h = 1, k = -3$

C. $p = -2, h = 2, k = -4$

D. $p = 5, h = 4, k = -3$

Answer: A

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