



MATHS

BOOKS - ARIHANT MATHS (ENGLISH)

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

2. What conic does the equation

$$25ig(x^2+y^2-2x+1ig)=ig(4x-3y+1ig)^2$$
 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.

Statement II: Conic $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$

represents a parabola if $h^2 = ab$.



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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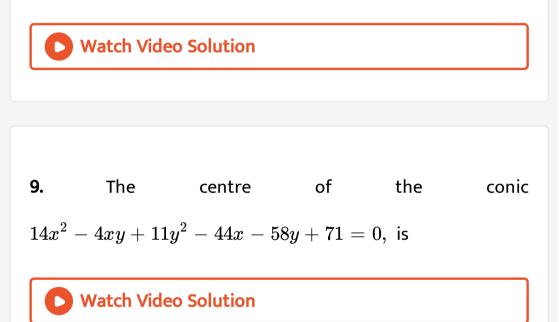
7. IF the equation of conic

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

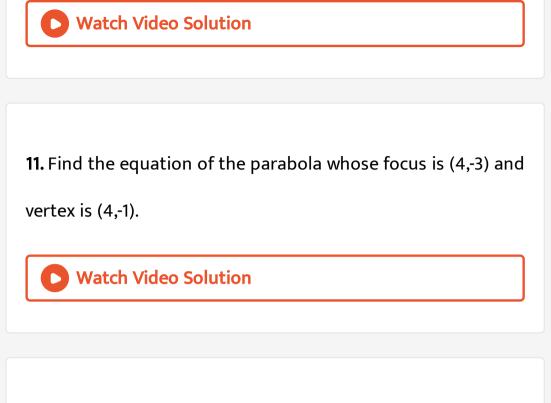
point, then find the value of λ



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?



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



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 $y^2 = 4 a x_{\cdot}$ Find the

locus of its points of trisection.

14. If y_1, y_2, y_3 be the ordinates of a vertices of the triangle inscribed in a parabola $y^3 = 4ax$, then show that the area of the triangle is $rac{1}{8a}|(y_1-y_2)(y_2-y_3)(y_3-y_1)|$.

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15. An equilateral triangle is inscribed in the parabola $y^2 = 4ax$ whose vertex is at the vertex of the parabola .Find the length of its side.



16. Prove that the equation of the parabola whose focus is (0,

0) and tangent at the vertex is x-y+1=0 is $x^2+y^2+2xy-4x+4y-4=0.$

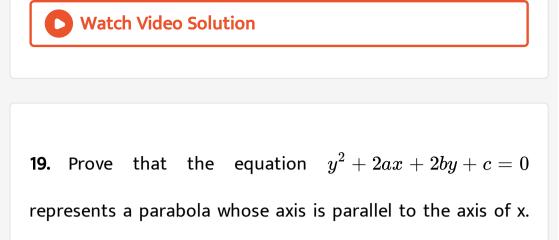
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17. Find the equation of the parabola whose latus-rectum is 4units, axis is the line 3x + 4y - 4 = 0 and the tangent at the vertex is the line 4x - 3 + 7 = 0.

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18. Find the vertex, focus, and directrix of the following parabolas:

 $x^2 + 8x + 12y + 4 = 0$



Find its vertex.

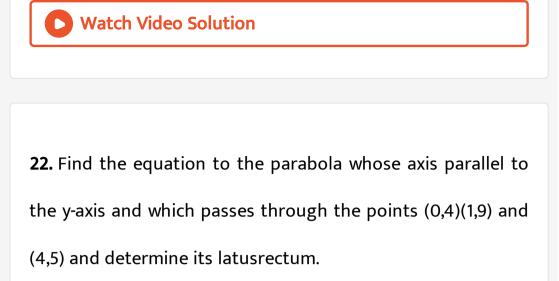


20. Derive the equation of the parabola with its vertex at

(3, 2) and its focus at (5, 2).



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





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 $y^2 - 4y + 9x + 13 = 0$.



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 $a\left(t+\frac{1}{t}\right)^2$.

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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.



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



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. If the line lx + my + n = 0 touches the parabola

$$y^2=4ax, \; {\sf prove \ that} \; {
m ln}=am^2$$

30. Show that $x \cos \alpha + a \sin^2 \alpha = p$ touches the parabola $y^2 = 4ax$ if $p \cos \alpha + a \sin^2 \alpha = 0$ and that the point of contact is $(a \tan^2 \alpha, -2a \tan \alpha)$.



31. Prove that the line $rac{x}{l}+rac{y}{m}=1$ 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 both $x^2+y^2=2a^2$ and $y^2=8ax$.

33. Find the equation of common tangent of $y^2 = 4ax$ and $x^2 = 4by$.

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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.



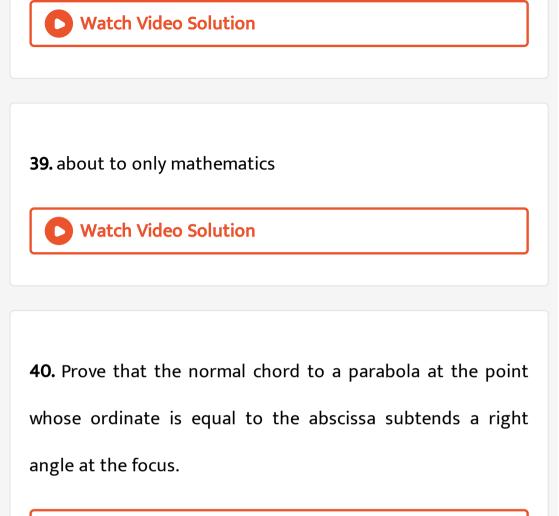
36. The tangents to the parabola $y^2 = 4ax$ at $P(at_1^2, 2at_1)$, and $Q(at_2^2, 2at_2)$, intersect at R. Prove that the area of the triangle PQR is $\frac{1}{2}a^2(t_1 - t_2)^3$

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37. Show that normal to the parabols $y^2 = 8x$ 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 $y\sqrt{2}x + 4a\sqrt{2} = 0$ is a normal chord of the parabola $y^2 = 4ax$. Also, find the point on the parabola where the given chord is normal to the parabola.



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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 , then prove that $(t_2)^2 \ge 8$.

42. If two of the three feet of normal drawn from a point to the parabola $y^2 = 4x$ are (1, 2) and (1,-2), then find the third foot.



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)

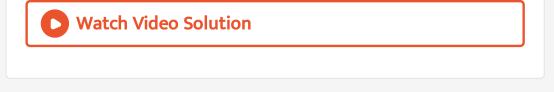
44. Find the locus of a point which is such that, the three normals through it cut the axis in points whose distance from the vertex are in A.P.



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

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46. A circle cuts the parabola $y^2 = 4ax$ at right angles and passes through the focus , show that its centre lies on the curve $y^2(a + 2x) = a(a + 3x)^2$.



47. 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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48. 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

$$rac{\left(y_{1}^{2}-4ax_{1}
ight)^{rac{3}{2}}}{2a}=rac{S_{11}^{rac{3}{2}}}{2a}$$

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

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50. The locus of the middle points of normal chords of the

parabola $y^2 = 4ax$ is-

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51. 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 $PA^2 = PB. PC$ 52. Find the equations of the tangent and normal to the parabola $y^2 = 4ax$ at the point $(at^2, 2at)$.

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53. 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.

54. Find the length of latusrectum intersect at the focus S its

coordinate are detained by solving.



55. 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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56. 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

57. Two parabolas have the same focus. If their directrices are the x- and the y-axis, respectively, then the slope of their common chord is ± 1 (b) $\frac{4}{3}$ (c) $\frac{3}{4}$ (d) none of these

A.
$$\pm 1$$

B. $rac{4}{3}$

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

D. None of these

Answer: A



58. Let us define a region R is xy-plane as a set of points (x,y) satisfying $[x^2] = [y]$ (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



59. The minimum area of circle which touches the parabolas $y = x^2 + 1$ and $y^2 = x - 1$ is $\frac{9\pi}{16} squart$ (b) $\frac{9\pi}{32} squart$

$$\frac{9\pi}{8}squart$$
 (d) $\frac{9\pi}{4}squart$

A. (a)
$$\frac{9\pi}{16}$$
 sq units
B. (b) $\frac{9\pi}{32}$ sq units
C. $\frac{9\pi}{8}$ sq units
D. $\frac{9\pi}{4}$ sq units

Answer: B



60. 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



61. If d is the distance between the parallel tangents with positive slope to $y^2 = 4x$ and $x^2 + y^2 - 2x + 4y - 11 = 0$, then `10

A. 10 < d < 20

 $\mathsf{B.}\, 4 < d < 6$

 $\mathsf{C}.\,d<4$

D. None of these

Answer: C

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62. 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 I 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 C. 3

D. 4

Answer: C

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$$\min\left[(x_1-x_2)^2 + \left(5+\sqrt{1-x_1^2}-\sqrt{4x_2}
ight)^2
ight], \ orall x_1, x_2 \in R,$$
is (a) $4\sqrt{5}+1$ (b) $3-2\sqrt{2}$ (c) $\sqrt{5}+1$ (d) $\sqrt{5}-1$

A. $4\sqrt{5} + 1$ B. $3 - 2\sqrt{2}$ C. $\sqrt{5} + 1$ D. $\sqrt{5} - 1$

Answer: B

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64. 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
- $\mathsf{B.}\, 2c < 2a+d$
- $\mathsf{C.}\, 2d < 2a+c$
- D. 2d < 2c + a

Answer: A



65. The locus of the midpoint of the focal distance of a variable point moving on theparabola $y^2 = 4ax$ is a parabola whose (a)latus rectum is half the latus rectum of the original parabola (b)vertex is $\left(\frac{a}{2}, 0\right)$ (c)directrix is y-axis. (d)focus has coordinates (a, 0)

A. latusrectum is half the latusrectum of the original parabola

B. Vertex is
$$\left(rac{a}{2},0
ight)$$

C. directrix is Y-axis

D. focus has the coordinate (a,0)

Answer: D

- **66.** 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

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

found

Answer: A



67. The equation of the line that touches the curves y=x|x| and $x^2+(y-2)^2=4$, where $x
eq 0,\,\, {
m is:}$ 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

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

9

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

Answer: A,C



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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



70. Find
$$\displaystyle rac{dy}{dx} at(6,1) ~~ ext{if}~~y^2 = 4ax$$

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71. Find
$$rac{dy}{dx}$$
 if $2x-3y=e^x$

Match Video Colution

72. 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



73. 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 $pig(\pi,\pi^2+1ig)$ and $Qig(\mu^2+1,\muig)$ 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



74. 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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76. Find
$$rac{dy}{dx}$$
 if $y^2 = 4ax$

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77. (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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78. Find
$$rac{dy}{dx}$$
 if $y^2 = 2ax$

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79. Parabola $y^2 = 4a(x - c_1)$ and $x^2 = 4a(y - c_2)$, where c_1andc_2 are variable, are such that they touch each other. The locus of their point of contact is (a) $xy = 2a^2$ (b) $xy = 4a^2$ (c) $xy = a^2$ (d) none of these

80. 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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81. 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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82. 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. **83.** 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.



84. Prove that the length of the intercept on the normal at the point $P(at^2, 2at)$ of a parabola $y^2 = 4ax$ made by the circle described on the line joining the focus and P as diameter is $a\sqrt{1+t^2}$.

85. If parabola of latus rectum I 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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86. Find the slope of normal to the curve if equation of the curve is $y = x^2 + x - 2$ at (1,2)

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87. 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 $\frac{TP'}{TP} + \frac{TQ'}{TQ} = 1$

88. 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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89. 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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90. 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 $4\left(\frac{x_1}{x_2}\right) + \left(\frac{y_1}{y_2}\right)^2 = 0.$

91. 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 $y^2 = 16a(x - 6a)$.



92. Find
$$\displaystyle rac{dy}{dx}$$
 if $(3x+a)(x+3a)=y^2$

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93. Find
$$\displaystyle rac{dy}{dx}$$
 if $\displaystyle rac{x^2}{a^2} + \displaystyle rac{y^2}{b^2-a^2} = 1$

94. 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. (a)x - a + b = 0 (b) x + a - b = 0 (c) x + a + b = 0 (d) x - a - b = 0

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Jee Type Solved Examples

1. Match the Following

	Column I	Column II	
(A)	If PQ is any focal chord of the parabola $y^2 = 32x$ and length of PQ can never be less than λ units, then λ is divisible by	(p)	2
(B)	A tangent is drawn to the parabola $y^2 = 4x$ at the point 'P' whose abscissa lies in the interval [1, 4]. If maximum possible area of the triangle formed by the tangent at 'P', ordinate of the point 'P' and the X-axis is λ sq units, then λ is divisible by	(q)	3
(C)	The normal at the ends of the latusrectum of the parabola $y^2 = 4x$ meet the parabola again at A and A' . If length $AA' = \lambda$ unit, then λ is divisible by	(r)	4
	The Marine -	(s)	6
		(t)	8



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



2. If the parabola $y^2 = 4ax$ passes through the point (3,2) then find the length of its latus rectum.

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

B. $\frac{2}{3}$
C. 1
D. $\frac{4}{3}$

Answer: D



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

A. ± 2

B. 4

 ${\rm C.}\pm3$

D. 5

Answer: C



4. The length of the latusrectum of the parbola whose focus

is (3,3) and directrix 3x - 4y - 2 = 0, is

A. a) 1

B. b) 2

C. c) 4

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

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

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

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

Answer: C



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

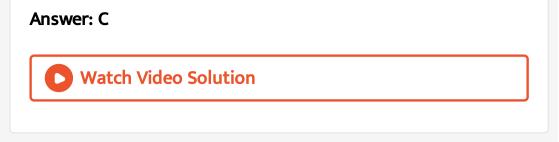
then the value of c, is

A. 4

B. -4

C. 16

D. -16



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



8. about to only mathematics

A. y=0

B. x=1

C. y=-1

D. x=-1

Answer: C



9. The equation of the latus return 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



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

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

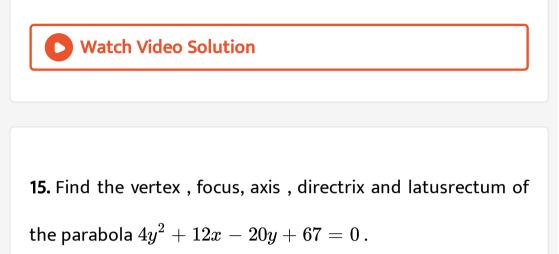
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13. Find the equation of the parabola whose focus is (5,3) and

directrix is the line 3x-4y+1=0.



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

17. The curve described parametrically by $x=t^2+t+1$, and $y=t^2-t+1$ represents. (a) a pair of straight lines (b) an ellipse (c) a parabola (d) a hyperbola



18. Prove that the equation of the parabola whose vertex and

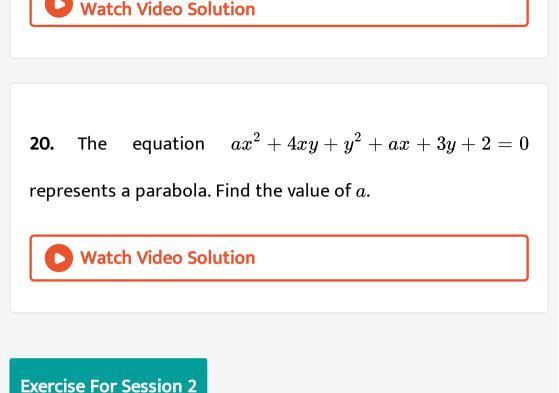
focus are on the X-axis at a distance a and a'from the origin

respectively is $y^2 = 4(a'-a)(x-a)$

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19. Find the equatin to the parabola whose axis is parallel to the y-xis and which passes through the point (0, 4), (1.9), and (-2, 6) and determine its latus rectum.





1. If $2x + y + \lambda = 0$ is a normal to the parabola $y^2 = -8x,$

then λ is (a)12 (b) -12 (c) 24 (d) -24

A. -24

B. -16

C. -8

Answer: D



2. If a normal chord subtends a right at the vertex of the parabola $y^{(2)}=4ax$, then find its inclination to the axis.

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

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

Answer: B::D

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

A. (a) x+y+a=0

B. (b) x+y-a=0

C. (c) x-y+a=0

D. (d) x-y-a=0

Answer: A



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



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. $4a^2$

 $\mathsf{B.}\,2a^2$

 $C. -4a^2$

D. $8a^2$

Answer: D

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



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



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

area.



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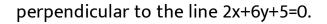
10. Find the equation of the normal to the parabola $y^2 = 4x$ which is

parallel to the line y=2x-5.



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

which is



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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.

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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 $x^2 = 2cy$.

14. Three normals are drawn from $(2\lambda, 0)$ to the parabola $y^2 = 4x$.Show that λ must be less 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



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

A. 90°

B. 30°

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

D. $45^{\,\circ}$

Answer: A



17. If (a, b) is the midpoint of a chord passing through the vertex of the parabola $y^2 = 4x$, then (a)a = 2b (b) $a^2 = 2b$ (c) $a^2 = 2b$ (d) $2a = b^2$

A. a=2b

B. 2a=b

 $\mathsf{C}.\,a^2=2b$

D. $2a = b^2$

Answer: D



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

A. (a)y-1=0

B. (b)y-2=0

C. (c)y+1=0

D. (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

Answer: C



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

22. A ray of light moving parallel to the x-axis gets reflected form a parabolic mirror whose equation is $(y-2)^2 = 4(x+1)$. Find the point on the axis of the parabola through which the ray must pass after reflection.

A. (-2,0)

B. (-1,2)

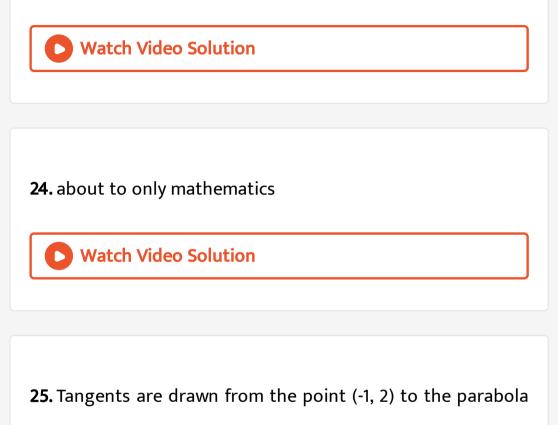
C. (0,2)

D. (2,0)

Answer: C



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



 $y^2=4x$ The area of the triangle for tangents and their

chord of contact is



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. A. $b=\sqrt{2}a$
- B. B. $a=b\sqrt{2}$
- C. C. c=2a
- D. D. a=2c

Answer: A



2. The equation of the 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) $y^2-4(a_1-a)(x-a)$ (d) noneA. $y^2 = 4(a_1 - a)x$ 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



3. If parabolas $y^2 = \lambda x$ and $25\Big[(x-3)^2+(y+2)^2\Big] = (3x-4y-2)^2$ are equal, then the value of λ is (a) 9 (b) 3 (c) 7 (d) 6

A. 3

B. 6

C. 7

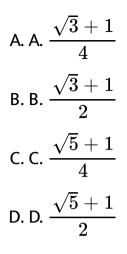
D. 9

Answer: B



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:



Answer: D



5. Find
$$rac{dy}{dx}$$
 if $y^2 = x$

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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)

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

Answer: A

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

A. p>0B. p<0C. 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 parabolas $y^2 = 4ax$ and $x^2 = 4ay$, then $d^2 + (2b + 3c)^2 = 0$ $d^2 + (3b + 2c)^2 = 0$ $d^2 + (2b - 3c)^2 = 0$ none of these

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

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

$$\mathsf{C}.\,d^2 + (2b - 3c)^2 = 0$$

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

Answer: A



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: (a) $\sqrt{\frac{bc}{a}}$ (b) ac^2 (c) b/a (d) $\sqrt{\frac{c}{a}}$

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

 $B.ac^2$

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

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

Answer: D



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. $\frac{2}{a}$

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

$$\mathsf{C}.-rac{1}{2}$$

D. 0

Answer: A



12. The normal to the parabola $y^2 = 4ax$ at three points P,Q and R meet at A. If S is the focus, then prove that $SP \cdot SR = aSA^2$.

A. $(SA)^{2}$ B. $(SA)^{3}$ C. $a(SA)^{2}$ D. $a(SA)^{3}$

Answer: C



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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 $4\sqrt{3}$ (b) 4 (c) $4\frac{\sqrt{6}}{7}$ (d) $2\sqrt{3}$ A. $4\sqrt{3}$

B. 4

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

D. $2\sqrt{3}$

Answer: D

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

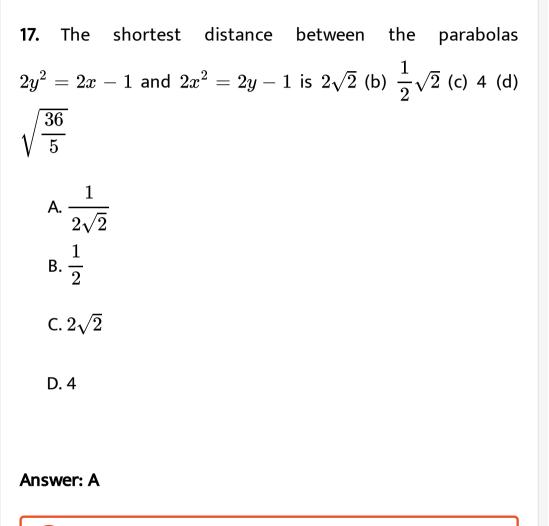
$$\mathsf{D}.\left(-rac{1}{2},0
ight)\cup\left(0,rac{1}{2}
ight)$$

Answer: D

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16. If two different tangents of $y^2=4x$ are the normals to $x^2 = 4by,$ then $|b| > rac{1}{2\sqrt{2}}$ (b) $|b| < rac{1}{2\sqrt{2}}$ $|b| > rac{1}{\sqrt{2}}$ (d) $|b| < \frac{1}{\sqrt{2}}$ A. $|b| < rac{1}{2\sqrt{2}}$ $|\mathsf{B}.|b| < \frac{1}{\sqrt{2}}$ $\mathsf{C}.\left|b\right|>\frac{1}{2\sqrt{2}}$ $|D.|b| > \frac{1}{\sqrt{2}}$

Answer: A



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18. Normals at two points $(x_1y_1)and(x_2, y_2)$ 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 $\sqrt{2}$ (b) $2\sqrt{2}$ (c) $4\sqrt{2}$ (d) none of these

A.
$$\sqrt{2}$$

B. $2\sqrt{2}$

 $\mathsf{C.}\,4\sqrt{2}$

D. $8\sqrt{2}$

Answer: C



19. A line is drawn form A(-2,0) to intersect the curve $y^2=4x$ at PandQ in the first quadrant such that $\frac{1}{AP} + \frac{1}{AQ} < \frac{1}{4}$. Then the slope of the line is always. $>\sqrt{3}\,({\sf b})\ <rac{1}{\sqrt{3}}\ >\sqrt{2}\,({\sf d})\ >rac{1}{\sqrt{3}}$ A. $<\frac{1}{\sqrt{3}}$ B. > $\frac{1}{\sqrt{3}}$ C. > $\sqrt{2}$ D. $> \sqrt{3}$

Answer: D



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

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

B. $2a(2-\sqrt{3})$
C. $4a(2-\sqrt{3})$
D. $8a(2-\sqrt{3})$

Answer: C



21. C is the center of the circle with center (0, 1) and radius unity. P is the parabola $y = ax^2$. The set of values of a for

which they meet at a point other than the origin is a > 0 (b)

$$a\in \left(0,rac{1}{2}
ight)\left(rac{1}{4},rac{1}{2}
ight)$$
 (d) $\left(rac{1}{2},\infty
ight)$

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



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. -1D. $\sqrt{2}$

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 find length of each sides of an equilateral triangle SMP(where S is the focus of the parabola).

A. 2 B. 4 C. 6

Answer: C

D. 8

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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 (a) $\left(\frac{1}{4}, 1\right)$ (b) $(4, 4)$ (c) $\left(3, \frac{2}{\sqrt{3}}\right)$ (d) $\left(3, -2\sqrt{3}\right)$
A. $\left(\frac{1}{4}, 1\right)$
B. $\left(3, -2\sqrt{3}\right)$
C. $\left(3, 2\sqrt{3}\right)$
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 $\cot heta_1 + \cot heta_2$ is $-2 \tan \varphi$ (b) $-2 \tan (\pi - \varphi)$ 0 (d) $2 \cot \varphi$

A. $-2 an\phi$

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 AandB meet the y-axis at A_1andB_1 , respectively. If the area of trapezium $\forall_1 B_1 B$ is equal to $12a^2$, then the angle subtended by A_1B_1 at the focus of the parabola is equal to $2\tan^{-1}(3)$ (b) $\tan^{-1}(3)$ $2\tan^{-1}(2)$ (d) $\tan^{-1}(2)$

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

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

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

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

Answer: C

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27. If the fourth term in the expansion of $\left(ax+\frac{1}{x}\right)is\frac{5}{2}$,

then find the values of $a \; and \; n_{\cdot}$

A. q=p

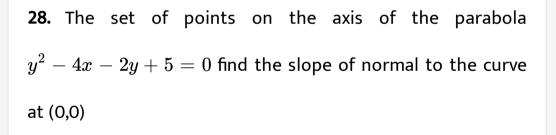
 $\mathsf{B.}\, q > p$

 $\mathsf{C}.\, q < p$

D. pq=1

Answer: D

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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.
$$\frac{213}{\sqrt{17}}$$

B. $\frac{219}{\sqrt{17}}$
C. $\frac{211}{\sqrt{17}}$
D. $\frac{210}{\sqrt{17}}$

Answer: D



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. about to only mathematics

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 < 0B. a > 0, b > 0C. 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 (a) x_1, a, x_2 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) $x_1x_2 + y_1y_2 = a^2$

A. x_1, a_1x_2 are in GP

B. $\displaystyle rac{y_1}{2}, \, a, \, y_2$ are in GP C. $\displaystyle -4, \, rac{y_1}{y_2}, rac{x_1}{x_2}$ are in GP D. $\displaystyle x_1x_2+y_1y_2=a^2$

Answer: B::C::D



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

Answer: A::C

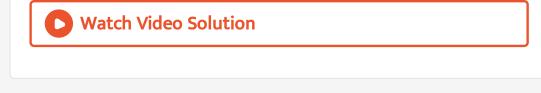
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7. If a point P on y^2x , the foot of the perpendicular from P on the directrix and the focus form an equilateral traingle , then the coordinates of P may be

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

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

Answer: A::C



8. The locus of foot of the perpendiculars drawn from the focus 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



9. The extremities of latus rectum 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



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 $\left(-2\sqrt{2}, 2\sqrt{2}\right)$

$$egin{aligned} &(-\infty,\ -\sqrt{2}ig) \cup ig(\sqrt{2},\inftyig) \ &(-\infty,\ -2\sqrt{2}-2ig) \cup ig(2\sqrt{2}-2,\inftyig) ext{ none of these} \ & ext{A.}\ m \in ig(-\infty,\ -\sqrt{3}ig) \ & ext{B.}\ m \in ig(-\infty,\ -\sqrt{3}-1ig) \ & ext{C.}\ m \in ig(\sqrt{3},\inftyig) \ & ext{D.}\ m \in ig(\sqrt{3}-1,\inftyig) \end{aligned}$$

Answer: B::C::D



12. The set of points on the axis of the parabola $(y-2)^2 = 4\left(x-rac{1}{2}
ight)$ 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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13. 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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14. A quadrilateral is inscribed in a parabola. Then the quadrilateral may be cyclic diagonals of the quadrilateral may be equal allpossible pairs of adjacent side may be perpendicular none of these

A. the quadrilateral may be cyclic

B. diagonals of the quadrilateral may be equal

perpendicular

D. None of the above

Answer: A::B



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



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

Length of latus rectum of parabola P is

A. `

Β.

C.

Answer: D



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



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
- В. -6
- C. 6
- D. 8

Answer: B



5. Find
$$rac{dy}{dx}$$
 if $y^2=4\lambda x$

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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.
$$x=-rac{3}{2}$$

B. $y=-rac{3}{2}$
C. $x=rac{3}{2}$
D. $y=rac{3}{2}$

Answer: D

•



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



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



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



10. If I 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

B. 3 C. 4 D. 5

A. 2

Answer: B

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11. IF I 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 $2^{\left| d-c
ight|}$

is

A. 1	
B. 2	
C. 4	
D. 8	

Answer: B

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12. If I 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

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13. Find the slope of tangent to the curve if equation of the curve is $y^2 = 4x$ at (5, 6)

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14. Find the slope of normal to the curve if equation of the curve is $y^2 = 4x$ at (4, 5)

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15. Find
$$rac{dy}{dx}$$
 if $y^2=10x$

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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 xaxis.

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 xaxis.

The radius of circle when a attains its maximum value is

A. 1/(rt.10) B. 1/(rt.5) C. 1

D. Rt. 5

Answer: B



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

A. 1 B. 2

C. 4

D. 8

Answer: B



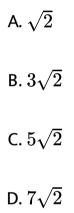
19. Find the slope of tangent to the curve if equation of the

curve is
$$x^2 + xy + y^2 - 2x - 2y + 1 = 0$$
 at (0,0)

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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



Answer: D



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



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=36,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 $\tan \alpha$.



2. 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 λ sq units, the value of λ is



3. 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



4. AB is a chord of the parabola $y^2 = 4ax$ with vertex $\stackrel{.}{ABC}$

is drawn perpendicular to AB meeting the axis at C_{\cdot} The

projection of BC on the axis of the parabola is a (b) 2a (c) 4a

(d) 8a

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5. 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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6. 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

7. Radius of the largest circle which passes through the focus

of the parabola $y^2=4x$ and contained in it, is



8. 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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9. The slope of line which belongs to family (1+ l) x + (l-1)y +

2(1-l) = 0 and makes shortest intercept on $x^2=4y-4$

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Parabola Exercise 5

1. Find
$$rac{dy}{dx}$$
 if $x=y^2-6y+11$

2. Find
$$rac{dy}{dx}$$
 if $x^2-ay+3=0$

D Watch Video Solution

3. Match the Following

	Column I		Column II	
(A)	The common chord of the circle $x^2 + y^2 = 5$ and the parabola $6y = 5x^2 + 7x$ will passes through the point (s)	(p)	(1, 2)	
(B)	Tangents are drawn from point (2, 3) to the parabola $y^2 = 4x$. Then, the points of contact are	(q)	(4,4)	
	From a point P on the circle $x^2 + y^2 = 5$, the equation of chord of contact to the parabola $y^2 = 4x$ is $y = 2(x - 2)$. Then, the coordinates of point P will be	(r)	(-2,1)	
	P(4, -4) and Q are points on the parabola $y^2 = 4x$ such that the area of ΔPOQ is 6 sq units, where O is the vertex. Then, the coordinates of Q may be	(s)	(9, - 6)	



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



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



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.

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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. (a) Statement I is true, Statement II is true and

Statement II is the correct explanation for Statement I.

B. (b) Statement I is true and Statement II is true but

Statement II is not the correct explanation for Statement I.

C. (c) Statement I is false, Statement II is false.

D. (d) Statement I is false, Statement II is true.

Answer: C



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 the extremities of focal chord of a parabola are $(at_1^2, 2at_1)$ and $(at_2^2, 2at_2)$, then $t_1t_2 = -1$.

A. (a) Statement I is true, Statement II is true and

Statement II is the correct explanation for Statement I.

B. (b) Statement I is true and Statement II is true but

Statement II is not the correct explanation for

Statement I.

C. (c) Statement I is true, Statement II is false.

D. (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 $4a\cos ec^2lpha$

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



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

Statement II Discriminant of $\left(x-1
ight)^2=x-x^2$ 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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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 from point (-1, 2) parallel to the axis of the parabola $y^2 = 4x$ strike the parabola, then find the equation of the reflected ray.



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. about to only mathematics	
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5. Find the slope of tangent to the curve if equation of the

curve is $y^2 = 4ax$ at (0,0)

6. 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) $2\cot \varphi$

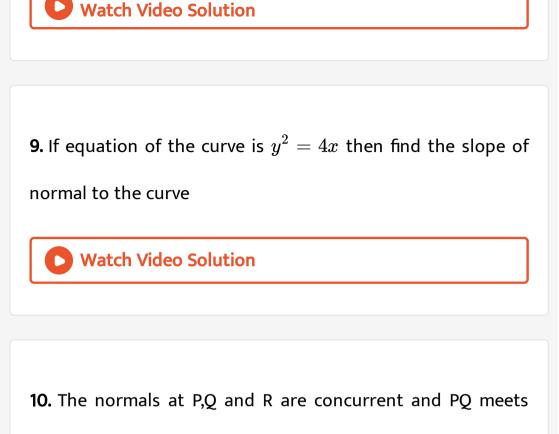


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8. Find the slope of normal to the curve if equation of the curve is $y^2 = 4ax$ at (0,0)

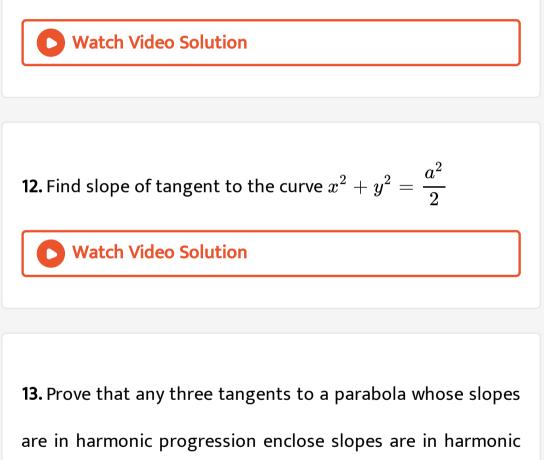




the diameter through R on the directrix x=-a . Prove that PQ

touches [or PQ enveloopes] the parabola $y^2+16a(x+a)=0.$

11. If the normals to the parabola $y^2 = 4ax$ at three points P, Q, andR meet at A, andS is the focus, then $SP\dot{S}q\dot{S}R$ is equal to a^2SA (b) SA^3 (c) aSA^2 (d) none of these



progression enclose a traingle of constant area .



1. about to only mathematics

A. (-6,-11)

B. (-9,-13)

C. (-10,-15)

D. (-6,-7)

Answer: D



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 a 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 find equation of the parabola.

A.
$$\left(x+y
ight)^2=\left(x-y-2
ight)$$

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



4. about to only mathematics

A. y=4(x-1)

B. y=0

C. y=-4 (x-1)

D. y=-30x-50

Answer: A::B



5. The locus of the vertex of the family of parabolas

$$y = rac{a^3x^2}{3} + rac{a^{2x}}{2} - 2a$$
 is $xy = rac{105}{64}$ (b) $xy = rac{3}{4}$ $xy = rac{35}{16}$ (d) $xy = rac{64}{105}$

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

B. $xy = \frac{3}{4}$
C. $xy = \frac{35}{16}$
D. $xy = \frac{64}{105}$

Answer: A

6. The angle between the tangents to the curve $y = x^2 - 5x + 6$ at the point (2, 0) and (3, 0) is (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$ (c) π (d) $\frac{\pi}{4}$ A. $\pi/3$ B. $\pi/2$ C. $\pi/6$

D. $\pi/4$

Answer: B



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

A. (a)1: $\sqrt{2}$

B. (b)1:2

C. (c)1:4

D. (d)1:8

Answer: C

8. Consider the circle $x^2 + y^2 = 9$ and the parabola $y^2 = 8x$. They intersect at P and Q in first and fourth quadrant respectively. Tangents to the circle at P and Q intersect the xaxis 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

9. Find slope of tangent to the curve if equation is $x^2+y^2=9$

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10. Statement 1 : The curve $y = -\frac{x^2}{2} + x + 1$ is symmetric with respect to the line x = 1 Statement 2 : A parabola is symmetric about its axis. Both the statements are true and Statements 1 is the correct explanation of Statement 2. Both the statements are true but Statements 1 is not the correct explanation of Statement 2. Statement 1 is true and Statement 2 is false Statement 1 is false and Statement 2 is true

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



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



12. Consider two curves $C1: y^2 = 4x$; $C2 = x^2 + y^2 - 6x + 1 = 0$. Then, a. C1 and C2 touch each other at one point b. C1 and C2 touch each other exactly at two point c. C1 and C2 intersect(but do not touch) at exactly two point d. C1 and C2 neither intersect nor touch each other

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. If a parabola has the origin as its focus and the line x = 2 as the directrix, then the coordinates of the vertex of the parabola are

A. (0, 2)

B.(1,0)

C.(0,1)

D.(2,0)

Answer: B

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14. about to only mathematics

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

B. directrix is at x=0

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

D. focus is (a,0)

Answer: A::D



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 find the slope of the line joining A and B.

A.
$$-rac{1}{r}$$

B. $rac{1}{r}$
C. $rac{2}{r}$
D. $-rac{2}{r}$

Answer: C::D



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 = 1A. 2x+1=0B. x=-1

C. 2x-1=0

D. x=1

Answer: B

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17. about to only mathematics

18. about to only mathematics

A.
$$x^2 = y$$

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

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

Answer: C

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19. about to only mathematics

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. about to only mathematics

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

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

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

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

Answer: A

21. about to only mathematics

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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 heta at the vertex of $y^2=4ax$, then an heta=

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 point lying on the line

y = 2x + a, a < 0.

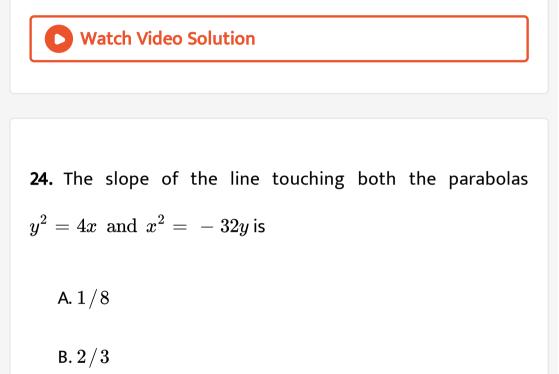
The length of chord PQ is

A. 7a

B. 5a

C. 2a

Answer: B



 $\mathsf{C.}\,1/2$

D. 3/2

Answer: C

25. about to only mathematics

B. 6

A. 3

C. 9

D. 15

Answer: D

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26. Let a, r, s, t be non-zero real numbers. Let $P(at^2, 2at), Q(ar^2, 2ar)$ and $S(as^2, 2as)$ 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).

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 $P(at^2, 2at), Q(ar^2, 2ar)$ and $S(as^2, 2as)$ 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.
$$rac{\left(t^2+1
ight)^2}{2t^3}$$

B. $rac{a\left(t^2+1
ight)^2}{2t^3}$
C. $rac{a\left(t^2+1
ight)^2}{t^3}$
D. $rac{a\left(t^2+2
ight)^2}{t^3}$

Answer: B



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



29. 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. about to only mathematics



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 $3\sqrt{2}$, then which of the following is (are) the coordinates of P?

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

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 center C of the circle , $x^2 + (y+6)^2 = 1$. Then the equation of the circle, passing through C and having its canter at P is

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

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

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

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

Answer: A



33. The circle C1 : $x^2 + y^2 = 3$, with center at O, intersects the parabola $x^2 = 2y$ 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 $2\sqrt{3}$ and centers Q2 and Q3, respectively. If Q_2 and Q_3 lies on the y-axis, then

A. $Q_2Q_3=12$

B. $R_2 R_3 = 4\sqrt{6}$

C. area of
$$\Delta OR_2R_3$$
 is $6\sqrt{2}$

D. area of ΔPQ_2Q_3 is $4\sqrt{2}$

Answer: A::B::C



34. Let P be the point on the 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.
$$SQ \colon QP = \left(\sqrt{5} + 1
ight) \colon 2$$

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

B. $2(\sqrt{2}+1)$
C. $2(\sqrt{2}-1)$
D. $4(\sqrt{2}-1)$

Answer: D

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