



MATHS

BOOKS - VIKAS GUPTA MATHS (HINGLISH)

PARABOLA

Exercise 1 Single Choice Problems

1. Let PQ be the latus rectum of the parabola $y^2 = 4x$ with vertex A. Minimum length of the

projection of PQ on a tangent drawn in
portion of Parabola PAQ is

A. 2

B. 4

C. $2\sqrt{3}$

D. $2\sqrt{2}$

Answer: D



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2. A normal is drawn to the parabola $y^2 = 9x$ at the point $P(4, 6)$. A circle is described on SP as diameter, where S is the focus. The length of the intercept made by the circle on the normal at point P is :

A. $\frac{17}{4}$

B. $\frac{15}{4}$

C. 4

D. 5

Answer: B



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3. A trapezium is inscribed in the parabola $y^2 = 4x$, such that its diagonal pass through the point $(1, 0)$ and each has length $\frac{25}{4}$. If the area of the trapezium be P , then $4P$ is equal to :

A. 70

B. 71

C. 80

D. 75

Answer: D



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4. The length of normal chord of parabola $y^2 = 4x$, which subtends an angle of 90° at the vertex is :

A. $6\sqrt{3}$

B. $7\sqrt{2}$

C. $8\sqrt{2}$

D. $9\sqrt{2}$

Answer: A



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5. If b and c are lengths of the segments of any focal chord of the parabola $y^2 = 4ax$, then write the length of its latus rectum.

A. $\frac{bc}{b+c}$

B. $\frac{2bc}{b+c}$

C. $\frac{b+c}{2}$

D. \sqrt{bc}

Answer: B



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6. The length of the shortest path that begins at the point $(-1, 1)$, touches the x -axis and then ends at a point on the parabola $(x - y)^2 = 2(x + y - 4)$, is :

A. $3\sqrt{2}$

B. 5

C. $4\sqrt{10}$

D. 13

Answer: A



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7. If the normals at P, Q, R of the parabola

$y^2 = 4ax$ meet in O and S be its focus, then

$. SP. SQ. SR =$

A. 2^3

B. $a^2(SO')$

C. $a(SO')^2$

D. None of these

Answer: C



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8. A and B are two points on the parabola $y^2 = 4ax$ with vertex O. if OA is perpendicular

to OB and they have lengths r_1 and r_2

respectively, then the value of $\frac{r_1^{4/3} r_2^{4/3}}{r_1^{2/3} + r_2^{2/3}}$ is

A. $16a^2$

B. a^2

C. $4a$

D. None of these

Answer: A



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9. Length of the shortest chord of the parabola $y^2 = 4x + 8$, which belongs to the family of lines $(1 + \lambda)y + (\lambda - 1)x + 2(1 - \lambda) = 0$ is

A. 6

B. 5

C. 8

D. 2

Answer: C



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10. If locus of mid point of any normal chord of the parabola :

$$y^2 = 4x \text{ is } x - a = \frac{b}{y^2} + \frac{y^2}{c},$$

where $a, b, c \in N$, then $(a + b + c)$ equals to :

A. 5

B. 8

C. 10

D. None of these

Answer: B



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11. Let tangents at P and Q to curve $y^2 - 4x - 2y + 5 = 0$ intersect at T. If S(2, 1) is a point such that $(SP)(SQ) = 16$, then the length ST is equal to :

A. 3

B. 4

C. 5

D. None of these

Answer: B



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12. Abscissa of two points P and Q on parabola $y^2 = 8x$ are roots of equation $x^2 - 17x + 11 = 0$. Let Tangents at P and Q meet at point T, then distance of T from the focus of parabola is :

A. 7

B. 6

C. 5

D. 4

Answer: A



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13. If $Ax + By = 1$ is a normal to the curve

$ay = x^2$, then :

A. $4A^2(1 - aB) = aB^3$

$$\text{B. } 4A^2(2 + aB) = aB^3$$

$$\text{C. } 4A^2(1 + aB) + aB^3 = 0$$

$$\text{D. } 2A^2(2 - aB) = aB^3$$

Answer: D



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14. The equation of a curve which passes through the point (3, 1), such the segment of any tangent between the point of tangency

and the x-axis is bisected at its point of intersection with y-axis, is :

A. $x = 3y^2$

B. $x^2 = 9y$

C. $x = y^2 + 2$

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

Answer: A



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15. The parabola $y = 4 - x^2$ has vertex P. It intersects x-axis at A and B. If the parabola is translated from its initial position to a new position by moving its vertex along the line $y = x + 4$, so that it intersects x-axis at B and C, then abscissa of C will be :

A. 3

B. 4

C. 5

D. 8

Answer: D



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16. A focal chord for parabola $y^2 = 8(x + 2)$ is inclined at an angle of 60° with positive x-axis and intersects the parabola at P and Q. Let perpendicular bisector of the chord PQ intersects the x-axis at R, then the distance of R from focus is :

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

B. $\frac{16\sqrt{3}}{3}$

C. $\frac{16}{3}$

D. $8\sqrt{3}$

Answer: C



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17. v34

A. 10

B. 11

C. 12

D. None of these

Answer: C



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18. The chord of contact of a point $A(x_A, y_A)$ of $y^2 = 4x$ passes through $(3, 1)$ and point A lies on $x^2 + y^2 = 5^2$. Then :

A. $5x_A^2 + 24x_A + 11 = 0$

B. $13x_A^2 + 8x_A - 21 = 0$

C. $5x_A^2 + 24x_A + 61 = 0$

D. $13x_A^2 + 21x_A - 31 = 0$

Answer: A



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Exercise 2 One Or More Than One Answer Is Are Correct

1. PQ is a double ordinate of the parabola $y^2 = 4ax$. If the normal at P intersect the line passing through Q and parallel to axis of x at G, then locus of G is a parabola with -

A. vertex at $(4a, 0)$

B. focus at $(5a, 0)$

C. directrix as the line $x - 3a = 0$

D. length of latus rectum equal to $4a$

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



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Exercise 3 Comprehension Type Problems

1. Consider the following lines :

$$L_1: x - y - 1 = 0$$

$$L_2: x + y - 5 = 0$$

$$L_3: y - 4 = 0$$

Let L_1 is axis to a parabola, L_2 is tangent at the vertex to this parabola and L_3 is another tangent to this parabola at some point P.

Let 'C' be the circle circumscribing the triangle

formed by tangent and normal at point P and axis of parabola. The tangent and normals at normals at the extremities of latus rectum of this parabola forms a quadrilateral ABCD.

Q. The equation of the circle 'C' is :

A. $x^2 + y^2 - 2x - 31 = 0$

B. $x^2 + y^2 - 2y - 31 = 0$

C. $x^2 + y^2 - 2x - 2y - 31 = 0$

D. $x^2 + y^2 + 2x + 2y = 31$

Answer: A



2. Consider the following lines :

$$L_1: x - y - 1 = 0$$

$$L_2: x + y - 5 = 0$$

$$L_3: y - 4 = 0$$

Let L_1 is axis to a parabola, L_2 is tangent at the vertex to this parabola and L_3 is another tangent to this parabola at some point P.

Let 'C' be the circle circumscribing the triangle formed by tangent and normal at point P and axis of parabola. The tangent and normals at

normals at the extremities of latus rectum of this parabola forms a quadrilateral ABCD.

Q. The given parabola is equal to which of the following parabola ?

A. $y^2 = 16\sqrt{2}x$

B. $x^2 = -4\sqrt{2}y$

C. $y^2 = -\sqrt{2}x$

D. $y^2 = 8\sqrt{2}x$

Answer: D



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3. Consider the following lines :

$$L_1: x - y - 1 = 0$$

$$L_2: x + y - 5 = 0$$

$$L_3: y - 4 = 0$$

Let L_1 is axis to a parabola, L_2 is tangent at the vertex to this parabola and L_3 is another tangent to this parabola at some point P.

Let 'C' be the circle circumscribing the triangle formed by tangent and normal at point P and axis of parabola. The tangent and normals at normals at the extremities of latus rectum of

this parabola forms a quadrilateral ABCD.

Q. The area of the quadrilateral ABCD is :

A. 16

B. 8

C. 64

D. 32

Answer: C



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1. Points A and B lie on the parabola $y = 2x^2 + 4x - 2$, such that origin is the mid-point of the line segment AB . If l be the length of the line segment AB , then find the unit digit of l^2 .



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2. For the parabola $y = -x^2$, let $a < 0$ and $b > 0$, $P(a, -a^2)$ and $Q(b, -b^2)$. Let M be the mid-point of PQ and R be the

point of intersection of the vertical line through M , with the parabola. If the ratio of the area of the region bounded by the parabola and the line segment PQ to the area of the triangle PQR be $\frac{\lambda}{\mu}$, where λ and μ are relatively prime positive integers, then find the value of $(\lambda + \mu)$:



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3. The chord AC of the parabola $y^2 = 4ax$ subtends an angle of 90° at points B and D on

the parabola. If points A, B, C and D are represented by $(at_i^2, 2at_i)$, $i = 1, 2, 3, 4$ respectively, then find the value of $\left| \frac{t_2 + t_4}{t_1 + t_3} \right|$.



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