MATHS

BOOKS - DHANPAT RAI & CO MATHS (HINGLISH)

PARABOLA

Illustration

1. The equation of conic section whose focus is at (-1 , 0), directrix is the $4x-3y+2=0$ and eccentricity $1/\sqrt{2}$, is

A.

$$34x^2 + 41y^2 + 24xy + 84x + 12y + 46 = 0$$

B.

$$34x^2 + 41y^2 - 24xy + 84x + 12y + 46 = 0$$

C.

$$34x^2 + 41y^2 - 24xy - 84x - 12y + 46 = 0$$

D. none of these.

Answer: A

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2. The conic represented by the equation $x^2 + y^2 - 2xy + 20x + 10 = 0$, is

A. Pair of straight lines

B. Circle

C. Paraabola

D. Ellipse

Answer: C

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

A. a circle

B. a parabola

C. an ellipse

D. a pair of straight lines

Answer: B

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4. The equation $16x^2 + y^2 + 8xy - 74x - 78y + 212 = 0$ represents

A. a circle

B. a parabola

C. an ellipse

D. a hyperbola

Answer: B

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

A. (2, 3)

B. (-2, 3)

C. (3, 2)

D. none of these

Answer: A

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6. If the focus of a parabola is at (0,-3) and its directrix is y = 3, then its equation is

A. $x^2 = -12y$

B. $x^2 = 12y$

C. $y^2 = -12x$

D. $y^2 = 112x$

Answer: A

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7. The equation of a parabola having focus (3, 0) and directrix x + 3 = 0, is

A. $y^2 = 12x$

B. $y^2 = -12x$

C. $x^2 = 12y$

D. $x^2 = -12y$

Answer: A

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8. The equation of the directrix of the parabola $25\left\{(x-2)^2+(y+5)^2\right\}=(3x+4y-1)^2$, is

A. 3x+4y=0

B. 3x+4y-1=0

C. 4x-3y=0

D. 3x+4y+1=0

Answer: B

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9. The length of the latusrectum of the parabola

$2\left\{(x-a)^2+(y-a)^2\right\}=(x+y)^2$, is

A. 2a

B. $2\sqrt{2}a$

C. 4a

D. $\sqrt{2}a$

Answer: B

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10. The vertex of the parabola $x^2 + y^2 - 2xy - 4x - 4y + 4 = 0$ is at

A. (1, 1)

B. (-1, -1)

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

D. none of these

Answer: C

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11. The vertex of a parabola is the point (a,b) and latusrectum is of length l. If the axis of the parabola is along the positive direction of y-axis, then its equation is :

A. $(x+a)^2 = \frac{l}{2}(2y-2b)$

B. $(x-a)^2 = \frac{l}{2}(2y-2b)$

C. $(x+a)^2 = \frac{l}{4}(2y-2b)$

D. $(x-a)^2 = \frac{l}{8}(2y-2b)$

Answer: B

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12. 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

$y^2 - 4(a_1 - a)x$ $y^2 - 4(a_1 - a)(x - a)$

$y^2 - 4(a_1 - a)(x - a)1)$ $none of these$

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. none of these

Answer: B

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13. If the parabola $y^2 = 4ax$ passes through (3, 2). Then the length of its latusrectum, is

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

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

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

D. 4

Answer: B

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

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

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

Answer: D

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16. 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. $x^2 = 2y$

C. $y^2 = x$

D. $x^2 = 2y$

Answer: C

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17. Find the coordinates of any point on the parabola whose focus is (0, 1) and directrix is $x + 2 = 0$

A. $(t^2 + 1, 2t - 1)$

B. $(t^2 + 1, 2t + 1)$

C. $(t^2, 2t)$

D. $(t^2 - 1, 2t + 1)$

Answer: D

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

A. (-4, 1)

B. (4, -1)

C. (-4, -1)

D. (4, 1)

Answer: A

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19. The focus of the parabola $y^2 - 4y - 8x + 4 = 0$ is,

A. (1, 1)

B. (1, 2)

C. (2, 1)

D. (2, 2)

Answer: D

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

A. $3y = 2$

B. $x + 3y = 3$

C. $2x = 3$

D. $y = 3$

Answer: A

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

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

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

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

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

Answer: C

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22. The equation of the parabola with its vertex at (1, 1) and focus at (3, 1) is

A. $(x - 3)^2 = 8(y - 1)$

B. $(y - 1)^2 = 8(x - 1)$

C. $(y - 1)^2 = 8(x - 3)$

D. $(x-1)^2 = 8(y-1)$

Answer: B

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

A. $(1/4, 0)$

B. $(1/2)$

C. $(3/4, 1)$

D. $(5/4, 1)$

Answer: D

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

A. 4

B. 6

C. 8

D. 10

Answer: C

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25. The length of the latusretum of the parabola

$169\left|(x-1)^2+(y-3)^2\right|=(5x-12y+7)^2$, is

A. $\frac{14}{13}$

B. $\frac{28}{13}$

C. $\frac{12}{13}$

D. $\frac{48}{13}$

Answer: D

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26. If (0, 3) and (0, 2) are respectively the vertex and focus of a parabola, then its equation, is

A. $x^2 + 8y = 12$

B. $y^2 + 8x = 32$

C. $x^2 - 8y = 32$

D. $y^2 - 8x = 32$

Answer: A

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27. If V and S are respectively the vertex and focus of the parabola $y^2 + 6y + 2x + 5 = 0$, then $SV =$ a. 2 b. 1/2 c. 1 d. none of these

A. 2

B. 43467

C. 1

D. none of these

Answer: B

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28. 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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29. The equation of the directrix of the parabola whose vertex and focus are (1, 4) and (2, 6) respectively, is

A. x+2y=4

B. x-y=3

C. 2x+y=5

D. x+3y=8

Answer: A

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30. A parabola has the origin as its focus and the line $x = 2$ as the directrix. Then the vertex of the parabola is at (1) (0, 2) (2) (1, 0) (3) (0, 1) (4) (2, 0)

A. (0, 1)

B. (2, 0)

C. (0, 2)

D. (1, 0)

Answer: D

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31. The length of the chord of the parabola $x^2 = 4ay$ passing through the vertex and having slope $\tan \alpha is$(a>0)`:

A. 2 a cosec α cot α

B. $4a \tan \alpha \sec \alpha$

C. $4a\cos\alpha\cot\alpha$

D. $4a\sin\alpha\tan\alpha$

Answer: A

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32. Write the length of het chord of the parabola $y^2 = 4ax$ which passes through the vertex and in inclined to the axis at $\frac{\pi}{4}$.

A. $4\sqrt{2}a$

B. $2\sqrt{2}a$

C. $\sqrt{2}a$

D. none of these

Answer: A

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33. Area of the triangle formed by the threepoints $'t_1'. 't_2'$ and $'t_3'$ on $y^2 = 4ax$ is $K|(t_1 - t_2)(t_2 - t_3)(t_3 - t_1)|$ then $K =$

A. $a|(t_1 - t_2)(t_2 - t_3)(t_3 - t_1)|$

B. $a^2|(t_1 - t_2)(t_2 - t_3)(t_3 - t_1)|$

C. $\frac{a^2}{2}|(t_1 - t_2)(t_2 - t_3)(t_3 - t_1)|$

D. $\frac{1}{4}a^2|(t_1 - t_2)(t_2 - t_3)(t_3 - t_1)|$

Answer: B

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34. The point $(a, 2a)$ is an interior point of the region bounded by the parabola $y^2 = 16x$ and the double ordinate through the focus. then find the values of a.

A. $a \in (-\infty, 4)$

B. $a \in (0, 4)$

C. $a \in (0, 2)$

D. $a \in (4, \infty)$

Answer: B

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35. Find the set of values of α in the interval $\left[\frac{\pi}{2}, 3\frac{\pi}{2}\right]$, for which the point $(\sin\alpha, \cos\alpha)$does not exist outside the parabola $2y^2 + x - 2 = 0$

A. $[\pi/2, 5\pi/6]$

B. $[\pi, 3\pi/2]$

C. $[\pi/2, 5\pi/6] \cup [\pi, 3\pi/2]$

D. $[5\pi/6, 3\pi/2]$

Answer: C

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36. If $(a^2, a-2)$ be a point interior to the region of the parabola $y^2 = 2x$ bounded by the chord joining the points $(2, 2)$ and $(8, -4)$, then the set of all possible real values of a is

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

B. $\left(-3, 2\right)$

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

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

Answer: D

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37. The number of integral values of a for which the point (-2a,a+1) will be interior point of the smaller region bounded by the circle $x^2 + y^2 = 4$ and the parabola $y^2 = 4x$ is:

A. (-1, 3/5)

B. $\left(-1, -5 + 2\sqrt{6}\right)$

C. $\left(-5 - 2\sqrt{6}, -5 + 2\sqrt{6}\right)$

D. none of these

Answer: B

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38. If the chord joining the points $t_1$and t_2 on the parabola $y^2 = 4ax$ subtends a right angle at its vertex then $t_2 =$

A. 0

B. 1

C. -1

D. 2

Answer: B

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

A. (32, 32)

B. (32, -32)

C. (-2, 8)

D. none of these

Answer: A

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40. PQ is any focal of the parabola $y^2 = 32x$.

The length of PQ cam never be less then

A. 8 units

B. 16 units

C. 32 units

D. 48 units

Answer: C

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41. If a focal chord of $y^2 = 4ax$ makes an angle $\alpha \in \left[0, \frac{\pi}{4}\right]$ with the positive direction of the x-axis, then find the minimum length of this focal chord.

A. $4a \sec^2 \alpha$

B. $2a\text{cosec}^2\alpha$

C. $4a \quad \text{cosec}^2\alpha$

D. $4a \cot^2 \alpha$

Answer: C

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42. If the length of a focal chord of the parabola $y^2 = 4ax$ at a distance b from the vertex is c, then

A. $2a^2 = bc$

B. $a^3 = b^2c$

C. $ac = b^2$

D. $b^2c = 4a^3$

Answer: D

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43. If l denotes the semi-latusrectum of the parabola$y^2 = 4ax$, and SP and SQ denote the segments of and focal chord PQ, being the focusm the SP, l, SQ are in the relation

A. A.P.

B. G.P.

C. H.P.

D. $l^2 = SP^2 + SQ^2$

Answer: C

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44. The latus rectum of a parabola whose focal chord is PSQ such that SP = 3 and SQ = 2

A. 24/5

B. 43804

C. 43621

D. none of these

Answer: A

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45. The harmonic mean of the segments of a focal chord of the parabola $y^2 = 16ax$, is

A. 2a

B. 4a

C. 8a

D. 16a

Answer: C

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46. If b and k are segments of a focal chord of the parabola $y^2 = 4ax$, then k =

A. $\frac{ab}{b-a}$

B. $\frac{b}{b-a}$

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

D. $\frac{ab}{a-b}$

Answer: A

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47. If PSQ is a focal chord of the parabola $y^2 = 8x$ such that $SP = 6$, then the length of SQ is 6 (b) 4 (c) 3 (d) none of these

A. 6

B. 4

C. 3

D. 8

Answer: C

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48. The locus of the midpoint of the segment joining the focus to a moving point on the parabola $y^2 = 4ax$ is another parabola with directrix $y = 0$ (b) $x = -a$ $x = 0$ (d) none of these

A. $x = -a$

B. $x = -\frac{a}{2}$

C. $x = 0$

D. $x = \frac{a}{2}$

Answer: C

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

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

Answer: D

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50. 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. $y^2 = 2x$

B. $x^2 = 2y$

C. $x^2 = y$

D. $y^2 = x$

Answer: B

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51. If the line y=mx+c touches the parabola $y^2 = 4a(x+a)$, then

A. $c = a + \frac{a}{m}$

B. $c = am + \frac{a}{m}$

C. $c = am + a$

D. none of these

Answer: B

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52. If lx + my + n = 0 is tangent to the parabola $x^2 = y$, them

A. $t^2 = 2mn$

B. $i = 4m^2n^2$

C. $m^2 = \frac{4}{n}$

D. $l^2 = 4mn$

Answer: D

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53. If the line x + y - 1 = 0 touches the parabola $y^2 = kx,$ thn the value of k, is

A. 4

B. -4

C. 2

D. -2

Answer: B

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54. If the line $y = mx + 1$ is tangent to the parabola $y^2 = 4x$, then find the value of $m\cdot$

A. 1

B. 2

C. 4

D. 3

Answer: A

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55. 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, 7)

B. (-6, 7)

C. (6, -7)

D. (-6, -7)

Answer: D

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56. 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 at one point

B. C_1 and C_2 touch eacth other exactly at two point

C. C_1 and C_2 intersect (but do not touch) at exactly two points

D. C_1 and C_2 neither intersect not touch each other

Answer: B

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57. The tangent to the parabola $y^2 = 4ax$ at $P\left(at_1^2, 2at_1\right)$ and $\mathrm{Q}\left(at_2^2, 2at_2\right)$ intersect on its axis, them

A. $t_1 = t_2$

B. $t_1 = -t_2$

C. $t_1 t_2 = 2$

D. $t_1 t_2 = -1$

Answer: B

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58. If $P(at_1^2, 2at_1)$ and $Q(at_2^2, 2at_2)$ are two points on the parabola at $y^2 = 4ax$, then that area of the triangle formed by the tangents at P and Q and the chord PQ, is

A. $\frac{1}{2}a^2|t_1 - t_2|^3$

B. $\frac{1}{2}a^2|t_1 - t_2|^2$

C. $a^2|t_1 - t_2|^3$

D. none of these

Answer: A

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59. Let A, B, C be three points on the parabola $y^2 = 4ax$ such that tangents at these points taken in pairs form a triangle PQR. Then, area $(\Delta ABC) : (\Delta PQR)$=

A. $1:1$

B. $2:1$

C. $1:2$

D. $2:3$

Answer: B

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

A. 1

B. 2

C. 3

D. 4

Answer: B

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61. If the tangents at the points $P and Q$ on the parabola $y^2 = 4ax$ meet at $T, and S$ is its focus,

A. $A.P.$

B. $G.P.$

C. $H.P.$

D. none of these

Answer: B

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62. 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

A. 8

B. 6

C. 5

D. 13

Answer: B

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63. AB, AC are tangents to a parabola $y^2 = 4ax$. If l_1, l_2, l_3 are the lengths of perpendiculars from A, B, C on any tangent to the parabola, then

A. l_1, l_2, l_3 are in GP

B. l_2, l_1, l_3 are in GP

C. l_3, l_1, l_2 are in GP

D. l_3, l_2, l_1 are in GP

Answer: B::C

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64. The locus of the point of intersection of tangents drawn at the extremities of a normal chord to the parabola $y^2 = 4ax$ is the curve

A. tangent at the vertex

B. its derectrix

C. its latusrectum

D. a parabola

Answer: B

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65. 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. x=-1

B. 2x-1=0

C. x=1

D. 2x+1=0

Answer: A

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66. The tangents to the parabola $y^2 = 4ax$ at the vertex V and any point P meet at Q. If S is the focus, then prove that $SP\dot{S}Q,$ and SV are in GP.

A. $A.\,P.$

B. $G.\,P.$

C. $H.\,P.$

D. none of these

Answer: B

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67. Parabola

$y^2 = 4a(x - c_1)$ and $x^2 = 4a(y - c_2)$ where c_1 and c_2 are variables, touch each other. Locus of their point of contact is

A. straight line

B. Circle

C. Parabola

D. hyperbola

Answer: D

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68. The focal chord to $y^2 = 16x$ is tangent to $(x-6)^2 + y^2 = 2$ then the possible values of the slope of this chord

A. (-1, 1)

B. (-2, 2)

C. (-2, 1/2)

D. (2, -1/2)

Answer: A

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69. The circle $x^2 + y^2 - 2x - 6y + 2 = 0$ intersects the parabola $y^2 = 8x$ orthogonally at the point P. The equation of the tangent to the parabola at P can be

A. x-y-4=0

B. 2x+y-2=0

C. x+y-4=0

D. 2x-y+1=0

Answer: D

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70. 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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71. Mutually perpendicular tangents $TAandTB$ are drawn to $y^2 = 4ax$. Then find the minimum length of AB.

A. a

B. 2a

C. 4a

D. 8a

Answer: C

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72. 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. (2, 4)

B. (-2, 0)

C. (-1, 1)

D. (0, 2)

Answer: B

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73. The triangle formed by the tangents to a parabola $y^2 = 4ax$ at the ends of the latus rectum and the double ordinate through the focus is

A. equilateral

B. isosceles

C. right-angled isosceles

D. dependent on the velue of a for its classification.

Answer: C

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74. The tangents at the end points of any chord through $(1, 0)$ to the parabola $y^2 + 4x = 8$

intersect

A. at 45° on $x-3=0$

B. at 45° on $x+3=0$

C. at 90° on $x+3=0$

D. at 90° on $x-3=0$

Answer: D

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

A. $a^{1/3}x + b^{1/3}y = (ab)^{1/3}$

B. $a^{1/3}x + b^{1/3}y = (ab)^{1/3} = 0$

C. $a^{2/3}x + b^{2/3}y = (ab)^{2/3}$

D. $a^{2/3}x + b^{2/3}y = (ab)^{2/3} = 0$

Answer: B

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76. find the common tangents of the circle $x^2 + y^2 = 2a^2$ and the parabola$y^2 = 8ax$

A. $x = \pm (y + 2a)$

B. $y = \pm (y + 2a)$

C. $x = \pm (y + a)$

D. $x = \pm (x + a)$

Answer: B

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77. Two equal parabolas have the same vertex and their axes are at right angles. The length of the common tangent to them, is

A. 3a

B. $3\sqrt{2}a$

C. 6a

D. 2a

Answer: B

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

A. y=0, y=4(x-1)

B. y=0, y=-4(x-1)

C. y=0, y=-30x-50

D. none of these

Answer: A

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79. The equation of the common tangents to the circle$(x-3)^2+y^2=9$ and the parabola $y^2=4x$ the x-axis, is

A. $\sqrt{3}y = 3x + 1$

B. $\sqrt{3}y = -(x + 1)$

C. $\sqrt{3}y = (x + 1)$

D. $\sqrt{3}y = -(3x + 1)$

Answer: C

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80. The common tangent of the parabolas $y^2 = 4x$ and $x^2 = -8y$, is

A. y=x+2

B. y=x-2

C. y=2x+3

D. none of these

Answer: D

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81. Find the equation of the common tangent to the curves $y^2 = 8x$ and xy=-1.

A. 3y=9y+2

B. y=2x+1

C. 2y=x+8

D. y=x+2

Answer: D

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82. The equation to the line touching both the parabolas $y^2 = 4x$ and $x^2 = -32y$ is

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

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

C. $x-2y-4=0$

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

Answer: D

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83. The slope of the line touching both the parabolas $y^2=4x$ and $x^2=-32y$ is (a) $\frac{1}{2}$ (b) $\frac{3}{2}$ (c) $\frac{1}{8}$ (d) $\frac{2}{3}$

A. 43473

B. 43499

C. 43467

D. 43526

Answer: C

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84. If m be the slope of common tangent of $y = x^2 - x + 1$ and $y = x^2 - 3x + 1$. Then m is equal to

A. 16

B. 7

C. 9

D. none of these

Answer: B

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85. If $\left(\frac{a}{b}\right)^{\frac{1}{3}} + \left(\frac{b}{a}\right)^{\frac{1}{3}} = \frac{\sqrt{3}}{2}$, then the angle of intersection of the parabola

$y^2 = 4ax$ and $x^2 = 4by$ at the point other than the origin is

A. $\sqrt{3}$

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

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

D. none of these

Answer: C

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86. The normals at the ends of the latusrectum of the parabola $y^2 = 4ax$ are (a, 2a) and (a, -2a).

A. $\frac{\pi}{6}$

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

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

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

Answer: D

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87. 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

A. 4

B. 2

C. 6

D. 9

Answer: B

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88. Find the equation of the normal to the parabola $y^2 = 4x$ which is parallel to $y - 2x + 5 = 0$

A. y=2x+12

B. y=2x-12

C. y=2x+8

D. y=-2x+12

Answer: B

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89. The value of $\theta \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ for which the line $y = x\cos\theta + 4\cos^3\theta - 14\cos\theta - 1$ is a normal to the parabola $y^2 = 16x$, is

A. $\pi/3$

B. $\pi/6$

C. $\pi/9$

D. $\pi/4$

Answer: C

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90. The line $lx+my+n=0$ is a normal to the parabola $y^2=4ax$ if

A. $al\left(l^2+2m^2\right)+m^2n=0$

B. $al\left(l^2+2m^2\right)+m^2n$

C. $al\left(2l^2+2m^2\right)+m^2n=0$

D. $al\left(2l^2+2m^2\right)+m^2n$

Answer: A

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91. The line $2x + y + \lambda = 0$ is a normal to the parabola $y^2 = -8x$, is λ=

A. 12

B. -12

C. 24

D. -24

Answer: C

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92. The normal to the parabola $y^2 = 4x$ at P (1, 2) meets the parabola again in Q, then coordinates of Q are

A. (-6, 9)

B. (9, -6)

C. (-9, -6)

D. (-6, -9)

Answer: B

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93. The normal at the point $\left(bt_1^2, 2bt_1\right)$ on the parabola $y^2 = 4bx$ meets the parabola again in the point $\left(bt_2^2, 2bt_2, \right)$ then

A. $t_2 = t_1 + \dfrac{2}{t_1}$

B. $t_2 = t_1 - \dfrac{2}{t_1}$

C. $t_2 = \; - t_1 + \dfrac{2}{t_1}$

D. $t_2 = t_1 - \dfrac{2}{t_1}$

Answer: B

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94. A normal drawn at a point P on the parabola $y^2 = 4ax$ meets the curve again at Q. The least distance of Q from the axis of the parabola, is

A. $2\sqrt{2}a$

B. $3\sqrt{2}a$

C. $4\sqrt{a}$

D. none of these

Answer: C

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95. The area between the parabola $y^2 = 4x$, normal at one end of latusrectum and X-axis in sq.units is

A. 60°

B. less then 60°

C. more then60°

D. less then 45°

Answer: C

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96. If $P(x_1, y_1), Q(x_2, y_2)$ and $R(x_3, y_3)$ are three points on $y^2 = 4ax$ and the normal at PQ and R meet at a point, then the value of $\frac{x_1 - x_2}{y_3} + \frac{x_2 - x_3}{y_1} + \frac{x_3 - x_1}{y_2} =$

A. 4a

B. 2a

C. a

D. 0

Answer: D

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97. If three distinct normals are drawn from $(2k, 0)$ to the parabola $y^2 = 4x$ such that one of them is x-axis and other two are perpendicular, then $k =$

A. $k < 1$

B. $k > 1$

C. $k \leq 1$

D. $k \geq 1$

Answer: B

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98. If three distinct normals are drawn from $(2k, 0)$ to the parabola $y^2 = 4x$ such that one of them is x-axis and other two are perpendicular, then $k =$

A. 1

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

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

D. none of these

Answer: C

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99. Find the point where the line $x + y = 6$ is a normal to the parabola $y^2 = 8x$

A. (18, -12)

B. (4, 2)

C. (2, 4)

D. (3, 3)

Answer: C

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100. Normals at P, Q, R are drawn to $y^2 = 4x$ which intersect at (3, 0). Then, area of ΔPQR, is

A. $2/5$

B. $1/2$

C. $5/2$

D. 2

Answer: D

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101. Normals at P, Q, R are drawn to $y^2 = 4x$ which intersect at (3, 0). Then, are of ΔPQR, is

A. $(2/3, 0)$

B. $(2/5, 0)$

C. $(5/2, 0)$

D. none of these

Answer: A

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102. Normals at P, Q, R are drawn to $y^2 = 4x$ which intersect at (3, 0). Then, are of ΔPQR, is

A. (2, 0)

B. (1, 0)

C. (2/3, 0)

D. (5/2, 0)

Answer: B

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103. 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 $\frac{b}{a - c} > 2.$

A. $0 < \frac{b}{a - c} < 1$

B. $\frac{b}{a - c} > 2$

C. $\frac{b}{a - c} < 0$

D. $1 < \frac{b}{a - c} < 2$

Answer: B

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104. If from a point A, two tangents are drawn to parabola $y^2 = 4ax$ are normal to parabola $x^2 = 4by$, then

A. $a^2 \geq b^2$

B. $a^2 \geq 4b^2$

C. $a^2 \geq 8b^2$

D. $8a^2 \geq b^2$

Answer: C

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105. Three normals drawn from a point (h k) to parabola $y^2 = 4ax$

A. $h > a \quad \text{and} \quad k^2 > \frac{4}{27a}(h - 2a)^2$

B. $h > 2a \quad \text{and} \quad k^2 > \frac{4}{27a}(h - 2a)^2$

C. $h > 2a \quad \text{and} \quad k^2 < \frac{4}{27a}(h - 2a)^2$

D. $h > 2a$

Answer: C

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106. The set of points on the axis of the parabola $y^2 = 4x + 8$ from which the three normals to the parabola are all real and different is $\{(k, 0) | k \leq -2\}$ (b) $\{(k, 0) \mid k\rangle - 2\}$ $\{(0, k) | k \succ 2\}$ (d) none of these

A. $\{(x, 0) : x \leq -2)\}$

B. $\{(x, 0) : x > -2)\}$

C. $\{(0, y) : y > -2)\}$

D. none of these

Answer: D

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107. Set of values of 'h' for which the number of distinct common normals of $(x-2)^2 = 4(y-3)$ and $x^2 + y^2 - 2x - hy - c = 0 (c > 0)$ is 3, is

A. $(2, \infty)$

B. $(4, \infty)$

C. $(2, 4)$

D. $(10, \infty)$

Answer: D

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108. The set of points on the axis of the parabola $y^2 = 4ax$, from which three distinct normals can be drawn to theparabola $y^2 = 4ax$, is

A. $\{(x, 0) : x > a\}$

B. $\{(x, 0) : x > 2a\}$

C. $\{(x, x > 4a\}$

D. $\{x : a < x < 2a\}$

Answer: B

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109. A normal drawn at a point P on the parabola $y^2 = 4ax$ meets the curve again at Q. The least distance of Q from the axis of the parabola, is

A. $4\sqrt{6}a$

B. $2\sqrt{6}a$

C. $3\sqrt{6}a$

D. none of these

Answer: A

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110. Find the number of distinct normals that can be drawn from $(-2, 1)$ to the parabola $y^2 - 4x - 2y - 3 = 0$

A. 1

B. 2

C. 3

D. 0

Answer: A

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111. If the normal chord of the parabola $y^2 = 4x$ makes an angle 45° with the axis of the parabola, then its length, is

A. 8

B. $8\sqrt{2}$

C. 4

D. $4\sqrt{2}$

Answer: B

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112. The slopes of tangents drawn from a point $(4, 10)$ to parabola $y^2 = 9x$ are

A. $1/4, 3/4$

B. $1/4, 9/4$

C. $1/4, 1/3$

D. none of these

Answer: B

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113. The angle between the tangents drawn from the point $(1, 4)$ to the parabola $y^2 = 4x$ is

A. $\pi / 6$

B. $\pi / 4$

C. $\pi / 3$

D. $\pi / 2$

Answer: C

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114. 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 $\tan \alpha$.

A. 3

B. 43468

C. 2

D. 43467

Answer: A

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

A. $(x+a)^2 \tan^2 \alpha = y^2 - 4ax$

B. $(x+a)\tan^2 \alpha = y^2 - 4ax$

C. $(x-a)^2 \tan^2 \alpha = y^2 - 4ax$

D. none of these

Answer: A

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116. The locus of the point of intersection of tangents drawn at the extremities of a normal chord to the parabola $y^2 = 4ax$ is the curve

A. x=a

B. x=-a

C. y=a

D. y=-a

Answer: B

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117. The locus of point of intersection of tangents inclined at angle 45° to the parabola $y^2 = 4x$ is

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

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

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

D. $y^2 + 4ax = (a - x)^2$

Answer: A

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118. The equation of the chord of contact of tangents from (2, 5) to the parabola $y^2 = 8x$, is

A. $4x + 5y + 8 = 0$

B. $4x - 5y + 8 = 0$

C. $4x - 5y - 9 = 0$

D. $4x + 5y - 8 = 0$

Answer: B

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119. Tangents are drawn to the parabola $y^2 = 4ax$ at the point where the line $lx + my + n = 0$ meets this parabola. Find the point of intersection of these tangents.

A. $(n, /1, -2am/1)$

B. $(l/n, -2am/n)$

C. $(n/m, -2al/m)$

D. none of these

Answer: A

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120. The chords of contact of the pairs of tangents drawn from each point on the line $2x + y = 4$ to the parabola $y^2 = -4x$ pass through the point

A. $(2, -1)$

B. $(1/2, 1/4)$

C. $(-1/2, -1/4)$

D. $(-2, 1)$

Answer: D

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121. 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 $\frac{1}{a}\sqrt{\left(y_1^2 - 4ax_1\right)\left(y_1^2 + 4a^2\right)}$

A. $\frac{1}{a}\sqrt{\left(y_1^2-4ax_1\right)\left(y_1^2+4a^2\right)}$

B. $\sqrt{\left(y_1^2-4ax_1\right)\left(y_1^2+4a^2\right)}$

C. $\frac{1}{a}\sqrt{\left(y_1^2+4ax_1\right)\left(y_1^2+4a^2\right)}$

D. none of these

Answer: A

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122. 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 $\frac{\left(y_1^2-4ax_1\right)^{\frac{3}{2}}}{2a}=\frac{S_{11}^{\frac{3}{2}}}{2a}$

A. $\dfrac{\left(y_1^2+4ax_1\right)^{3/2}}{2a}$

B. $\dfrac{\left(y_1^2-4ax_1\right)^{3/2}}{2a}$

C. $\dfrac{\left(y_1^2+4ax_1\right)^{3/2}}{a}$

D. none of these

Answer: B

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123. Equation of the chord of the parabola $y^2 = 8x$ which is bisected at the point $(2, -3)$ is

A. $4x + 3y + 1 = 0$

B. $2x + 3y + 5 = 0$

C. $3x + 4y + 6 = 0$

D. $2x - 3y - 12 = 0$

Answer: A

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124. if the line $4x + 3y + 1 = 0$ meets the parabola $y^2 = 8x$ then the mid point of the chord is

A. $(5/4, 3)$

B. $(2, 4)$

C. $(5/2, 14/3)$

D. $(5, 8)$

Answer: A

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125. The locus of the middle points of the chords of the parabola $y^2 = 4ax$ which pass through the focus, is

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

B. $y^2 - ax + 2a^2 = 0$

C. $y^2 - 2ax + 2a^2 = 0$

D. $y^2 - 2ax + a^2 = 0$

Answer: C

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126. 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. $y^2 - 2ax + 2a^2 = 0$

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

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

D. $y^2 - 2ax - 8a^2 = 0$

Answer: B

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127. If the tangent at the point $P(2, 4)$ to the parabola $y^2 = 8x$ meets the parabola

$y^2 = 8x + 5$ at $Q and R$, then find the midpoint

of chord QR.

A. $(2, 4)$

B. $(4, 2)$

C. $(7, 9)$

D. none of these

Answer: A

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128. The tangent at the point $P(x_1, y_1)$ to the parabola $y^2 = 4ax$ meets the parabola $y^2 = 4a(x + b)$ at Q and R. the coordinates of the mid-point of QR are

A. (x_1, y_1)

B. $(x_1 + b, y_1)$

C. $(x_1 + b, y_1 + b)$

D. $(x_1 - b, y_1 - b)$

Answer: A

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129. The locus of the mid-point of the chords of the parabola $x^2 = 4py$ having slope m, is a

A. circle with center at origin and radius | 2 pm |

B. line parallel to x-axis at a distance | 2 pm | from it

C. line parallel to y-axis a distance | 2 pm | from it

D. line parallel to y=mx, $m \neq 0$ at a distance |

2 pm | from it

Answer: C

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130. The polar of line point (2, 1) with respect to the parabola $y^2 = 6x$, is

A. $y = 3x + 2$

B. $y = 3x + 6$

C. $3y = x + 6$

D. $y = 3x + 4$

Answer: B

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131. The pole of the line lx+my+n=0 with respect to the parabola $y^2 = 4ax$, is

A. $\left(\frac{n}{l}, -\frac{2am}{l}\right)$

B. $\left(\frac{n}{m}, -\frac{2am}{m}\right)$

C. $\left(\frac{n}{m}, -\frac{2al}{m}\right)$

D. none of these

Answer: A

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132. The locus of the poles of tangents to the parabola $y^2 = 4ax$ with respect to the parabola $y^2 = 4ax$ is

A. a circle

B. a parabola

C. a straight line

D. an ellipse

Answer: B

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Section I - Solved Mcqs

1. If the equation $\lambda x^2 + 4xy + y^2 + \lambda x + 3y + 2 = 0$ represent a parabola then find λ.

A. -4

B. 4

C. 0

D. none of these

Answer: C

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

A. circle

B. parabola

C. a pair of straght lines

D. none of these

Answer: C

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3. The number of chords drawn from point (a, a) on the circle $x^2 + y^2 = 2a^2$, which are bisected by the parabola $y^2 = 4ax$, is

A. 1

B. 4

C. 2

D. 0

Answer: C

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4. The length of the latusrectum of the parabola

$x = ay^2 + by + c$, is

A. $a/4$

B. $a/3$

C. $1/a$

D. $1/(4a)$

Answer: C

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5. If the line $x-1=0$ is the directrix of the parabola $y^2-kx+8=0$, then one of the values of k is $\frac{1}{8}$ (b) 8 (c) 4 (d) $\frac{1}{4}$

A. $1/8$

B. 8

C. 4

D. 43469

Answer: C

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6. The number of parabolas that can be drawn if two ends of the latus rectum are given 1 (b) 2 (c) 4 (d) 3

A. 1

B. 2

C. 0

D. infinite

Answer: B

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7. The number of points with integral coordinates that lie in the interior of the region common to the circle $x^2 + y^2 = 16$ and the parabola $y^2 = 4x$, is

A. 8

B. 10

C. 16

D. none of these

Answer: A

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8. Range of values of k for which the point (k,-1) is exterior to both the parabolas $y^2 = |x|$ is

A. $a \in (0, 1)$

B. $a \in (-1, 1)$

C. $a \in (-1, 0)$

D. none of these

Answer: B

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9. 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

A. a

B. 2a

C. 4a

D. 8a

Answer: C

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10. The coordinates of an end-point of the latusrectum of the parabola $(y-1)^2 = 4(x+1)$, are

A. (0, -3)

B. (0, -1)

C. (0, 1)

D. (1, 3)

Answer: B

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11. M is the foot of the perpendicular from a point P on a parabola $y^2 = 4ax$ to its directrix and SPM is an equilateral triangle, where S is the focus. Then find SP .

A. a

B. 2a

C. 3a

D. 4a

Answer: D

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12. What is the equation of the parabola, whose vertex and focus are on the x-axis at distance a and b from the origin respectively ? $(b > a > 0)$

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

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

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

D. none of these

Answer: A

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13. 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 9 (b) 3 (c) 7 (d) 6

A. 1

B. 2

C. 4

D. 6

Answer: D

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14. The point on $y^2 = 4ax$ nearest to the focus has to abscissa equal to

A. $-a$

B. a

C. $a/2$

D. 0

Answer: D

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15. The focal chord of the parabola $y^2 = ax$ is $2x - y - 8 = 0$. Then find the equation of the directrix.

A. $x + 4 = 0$

B. $X - 4 = 0$

C. $Y - 4 = 0$

D. $Y + \ + 4 = 0$

Answer: A

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16. Number of common chords of a parabola & a circle can be

A. 2

B. 4

C. 6

D. 8

Answer: C

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17. A ray of light moving parallel to the x-axis gets reflected from parabolic mirror whose equation is $(y-3)^2 = 8(x+2)$. After reflection, the ray must pass through

A. (0, 3)

B. (3, 0)

C. (0, 0)

D. none of these

Answer: A

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18. If $y+b=m_1(x+a)$and $y+b=m_2(x+a)$ are two tangents to the paraabola $y^2=4ax$ then

A. $m_1+m_2=0$

B. $m_1m_2=1$

C. $m_1m_2=-1$

D. none of these

Answer: C

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19. If normals at the ends of the double ordinate x = 4 of parabola $y^2 = 4x$ meet the curve again in P and P' respectively, then PP' =

A. 6

B. 12

C. 10

D. none of these

Answer: B

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20. Radius of the largest circle which passes through the focus of the parabola $y^2 = 4x$ and contained in it, is 13

A. 8

B. 4

C. 2

D. 5

Answer: B

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21. If the tangents and normals at the extremities of a focal chord of a parabola intersect at (x_1, y_1) and (x_2, y_2), respectively, then $x_1 = y^2$ (b) $x_1 = y_1$ $y_1 = y_2$ (d) $x_2 = y_1$

A. $x_1 = x_2$

B. $x_1 = y_2$

C. $y_1 = y_2$

D. $x_2 = y_1$

Answer: C

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22. The axis of a parabola is along the line y = x and its vertex and focus are in the first quadrant at distances $\sqrt{2}, 2\sqrt{2}$ respectively, from the origin. The equation of the parabola, is

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

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

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

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

Answer: D

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23. If the normals any point to the parabola $x^2 = 4y$ cuts the line y = 2 in points whose abscissar are in A.P., them the slopes of the tangents at the 3 conormal points are in

A. AP

B. GP

C. HP

D. none of these

Answer: B

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24. Let ABCD be a square of side length 2 units. C_2 is the fircle through the vertices A, B, C, D and C_1 is the circle touching all the of the square ABCD. L is a lien through vertex A. A circle touches the line L and the circle C_1 externally such that both the circles are on the same side of the line L. The locus of the centre of the circle is

A. an ellipse

B. a hyperbola

C. a parabola

D. a pair of straight lines

Answer: C

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25. Minimum distance between $y^2 - 4x - 8y + 40 = 0$ and $x^2 - 8x - 4y + 40 = 0$ is

A. 0

B. $\sqrt{3}$

C. $2\sqrt{2}$

D. $\sqrt{2}$

Answer: D

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26. ABCD is a square with side AB = 2. A point P moves such that its distance from A equals its distance from the line BD. The locus of P meets the line AC at T_1 and the line through A parallel to BD at T_2 and T_3. The area of the triangle $T_1T_2T_3$ is :

A. $\frac{1}{2}$sq. unit

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

C. 1sq. unit

D. 2sq. unit

Answer: C

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27. 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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28. If $P\left(1, 2\sqrt{2}\right), R(9, 0), S(-1, 0)$, the radius of the circumcircle of ΔPRS, is

A. 5

B. $3\sqrt{3}$

C. $3\sqrt{2}$

D. $2\sqrt{3}$

Answer: B

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29. In exampla 27, the radius of the incircle of ΔPQR, is

A. 4

B. 3

C. 43680

D. 2

Answer: D

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30. Circle described on the focal chord as diameter touches the tangent at the vertex

A. the axis

B. the tangent at the vertex

C. the directrix

D. none of these

Answer: B

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31. 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. 2

D. none of these

Answer: B

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32. If the circle $x^2 + y^2 + 2ax = 0, a \in R$ touches the parabola $y^2 = 4x$, them

A. $a \in (-\infty, 0)$

B. $a \in (0, \infty)$

C. $a \in (2, \infty)$

D. none of these

Answer: B

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33. The area of the trapezium whose vertices lie on the parabola $y^2 = 4x$ and its diagonals pass through (1,0) and having length $\frac{25}{4}$ units each is

A. $\frac{75}{4}$

B. $\frac{625}{16}$

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

D. $\frac{25}{8}$

Answer: A

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34. If (h, k) is a point on the axis of the parabola $2(x-1)^2 + 2(y-1)^2 = (x+y+2)^2$ from where three distinct normals can be drawn, then prove that $h > 2$.

A. $h > 2$

B. $h < 4$

C. $h > 8$

D. $h < 8$

Answer: A

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35. The radius of the circle whose centre is (-4,0) and which cuts the parabola $y^2 = 8x$ at A and B such that the common chord AB subtends a right angle at the vertex of the parabola is equal

to

A. 4

B. 3

C. $\sqrt{18}$

D. 5

Answer: A

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36. PSQ is a focal chord of a parabola whose focus is S and vertex is A. PA, QA, are produced to meet the directrix in R and T. Then $\angle RST$ is equal to

A. 90°

B. 60°

C. 45°

D. 30°

Answer: A

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37. 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 $(2a/3, 0)$

B. Directri is $\mathrm{x} = 0$

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

D. Focus is $(-a, 0)$

Answer: A

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38. The vertex of the parabola $y^2 = 8x$ is at the centre of a circle and the parabola cuts the circle at the ends of itslatus rectum. Then the equation of the circle is

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

B. $x^2 + y^2 = 20$

C. $x^2 + y^2 = 80$

D. none of these

Answer: B

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39. Let A, B and C be three points taken on the parabola $y^2 = 4ax$ with coordinates $(at_i^2, 2at_i), i = 1, 2, 3,$ where t_1, t_2 and t_3 are in A.P. If AA', BB' and CC' are focal chords and coordinates of A', B' and C' are $\left(at'^2_i, 2at'_i\right), i = 1, 2, 3,$ them t'_1, t'_2 and t'_3 are in

A. AP

B. GP

C. HP

D. none of these

Answer: C

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40. Let there be two parabolas with the same axis, focus of each being exterior to the other and the latus rectam being 4a and 4b. The locus of the middle points of the intercepts between the parabolas made on the lines parallel to the common axis is a:

A. straight line if a $> b$

B. parabola if a $\in b$

C. parabola for all a, b

D. ellipse, if $b > a$

Answer: B

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41. Let A and B be two points on $y^2 = 4ax$ such that normals to the curve at A and B meet at point C, on the curve, then chord AB will always pass through a fixed point whose coordinates, are

A. (2a, 0)

B. (-a, 0)

C. (-2a, 0)

D. (a, 0)

Answer: B

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42. The set of real values of 'a' for which at least one tangent to $y^2 = 4ax$ becomes normal to the circle

$x^2 + y^2 - 2ax - 4ay + 3a^2 = 0$, is

A. $[1, 2]$

B. $[\sqrt{2}, 3]$

C. R

D. none of these

Answer: C

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43. The locus of the mid-point of the line segment joining a point on the parabola $Y^2 = 4ax$ and the point of contact of circle drawn on focal distance of the point as diameter with the tangent at the vertex, is

A. $y^2 = 9ax$

B. $9y^2 = 2ax$

C. $2x^2 = 9ay$

D. $2y^2 = 9ax$

Answer: D

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44. The tangent and normal at the point p(18, 12) of the parabola $y^2 = 8x$ intersects the x-axis at the point A and B respectively. The equation of the circle through P, A and B is given by

A. $x^2 + y^2 + 4x - 540 = 0$

B. $x^2 + y^2 - 6x - 360 = 0$

C. $x^2 + y^2 - 4x - 396 = 0$

D. $x^2 + y^2 - 2x - 444 = 0$

Answer: C

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45. Tangent and normal at any point P of the parabola $y^2 = 4ax(a > 0)$ meet the x-axis at T and N respectively. If the lengths of sub-tangent and sub-normal at this point are equal, then the area of ΔPTN is given by

A. $4a^2$

B. $6\sqrt{2}a^2$

C. $4\sqrt{2}a^2$

D. none of these

Answer: D

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46. The point of intersection of the curve whose parametrix equations are $x = t^2 + 1, y = 2t$ and $x = 2s, y = \frac{2}{s},$ is given by

A. (1, -3)

B. (2, 2)

C. (-2, 4)

D. (1, 2)

Answer: B

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47. The locus of the midpoint of the segment joining the focus to a moving point on the parabola $y^2 = 4ax$ is another parabola with directrix $y = 0$ (b) $x = \ -a\ x = 0$ (d) none of these

A. x = -a

B. x = a

C. x = 0

D. x = a/2

Answer: C

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48. The radical centre of the circles drawn on the focal chords of $y^2 = 4ax$ as diameters, is

A. (-a, 0)

B. (a, 0)

C. (0, 0)

D. (a, a)

Answer: C

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49. For each parabola $y = x^2 + px + q$, meeting coordinate axes at 3-distinct points, if circles are drawn through these points, then the family of circles must pass through

A. (1, 0)

B. (0, 1)

C. (1, 1)

D. (p, q)

Answer: B

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50. Let $A(x_1, y_1)$ and $B(x_2, y_2)$ be two points on the parabola $y^2 = 4ax$. If the circle with chord AB as a diameter touches the parabola, then $|y_1 - y_2| =$

A. 4a

B. 8a

C. $6\sqrt{2}a$

D. none of these

Answer: B

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51. 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. $\pm\frac{1}{r}$

B. $\pm\frac{2}{r}$

C. $\pm\frac{3}{r}$

D. $\pm\frac{1}{2}r$

Answer: B

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52. Find the shortest distance between the line $x-y+1=0$ and the curve $y^2=x$.

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

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

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

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

Answer: B

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53. 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 -

A. 4

B. 3

C. 2

D. 8

Answer: A

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54. Let PQ be a focal chord of the parabola $y^2 = 4ax$ such that tangents at P and Q meet at point on the line $y = 2x + a, a > 0,$ If PQ subtends an angle θ at the vertex of $y^2 = 4ax,$ then tan $\theta =$

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

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

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

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

Answer: D

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55. 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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56. 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. $\dfrac{(t+1)^2}{2t^3}$

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

C. $\dfrac{a\left(t^2+1\right)^2}{t^3}$

D. $\dfrac{a\left(t^2+2\right)^2}{t^3}$

Answer: B

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57. 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. $(4, 2\sqrt{2})$

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

C. $(1/4, 1/\sqrt{2})$

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

Answer: A::D

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58. 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

A. 3

B. 6

C. 8

D. 4

Answer: D

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59. PSQ is a focal chord of a parabola whose focus is S and vertex is A. PA, QA, are produced to meet the dirrecterix in R and T. Then $\angle RST$ is equal to

A. 90°

B. 60°

C. 45°

D. 30°

Answer: A

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60. 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. $SP : QP = \sqrt{5} + 1) : 2$

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 1/2

Answer: B

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

B. $x^2 + y^2 = \frac{1}{4}x + 2y - 24 = 0$

C. $x^2 + y^2 - 4x + 9y + 12 = 0$

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

Answer: D

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62. P and Q are two distinct points on the parabola, $y^2 = 4x$ with parameters t and t_1 respectively. If the normal at P passes through Q, then the minimum value of t_1^2 is

A. 4

B. 6

C. 8

D. 2

Answer: C

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63. Let PQ be a focal chord of the parabola $y^2 = 4x$. If the centre of a circle having PQ as its diameter lies on the line $\sqrt{5}y + 4 = 0$, then length of the chord PQ, is

A. $\frac{36}{5}$

B. $\frac{26}{5}$

C. $\frac{36\sqrt{5}}{5}$

D. $\frac{26\sqrt{5}}{5}$

Answer: A

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64. The centres of those circles which touch the circle, $x^2 + y^2 - 8x - 8y - 4 = 0$, externally and also touch the x-axis, lie on : (1) a circle. (2)

an ellipse which is not a circle. (3) a hyperbola. (4) a parabola.

A. an ellipe which is not a circle

B. a hyperbola

C. a parabola

D. a circle

Answer: C

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

A. $2(\sqrt{2}+2)$

B. $2(\sqrt{2}-1)$

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

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

Answer: C

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

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

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

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

Answer: D

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SECTION-I (SOLVED MCQs EXAMPLE)

1. Three points A, B and C are considered on a parabola. The tangents to the parabola at these points from a triangle MNP (NP being tangent at A, PM at B and MN at C). If the line through B and parallel to axis of parabola intersects AC at L. then the quadrilateral LMNP

A. is always a parallelogram

B. can never be parallelogram

C. is parallelogram only when ordinates of A, B, C are in A.P.

D. has exactly sides parallel to each always.

Answer: A

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Section II - Assertion Reason Type

1. 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-1 is True, Statement - 2 is true, Statement-2 is a correct explanation for Statement-1`

B. Statement-1 is True, Statement - 2 is true, Statement-2 is not a correct explanation for Statement-1

C. Statement-1 is True, Statement - 2 is False.

D. Statement-1 is True, Statement - 2 is True.

Answer: A

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2. Statement-1: The tangents at the extrenities of a forcal of the parabola $y^2 = 4ax$ intersect on the line x + a = 0.

Statement-2: The locus of the point of intersection of perpendicular tangents to the parabola is its directrix

A. Statement-1 is True, Statement - 2 is true, Statement-2 is a correct explanation for Statement-1`

B. Statement-1 is True, Statement - 2 is true, Statement-2 is not a correct explanation for Statement-2

C. Statement-1 is True, Statement - 2 is False.

D. Statement-1 is True, Statement - 2 is True.

Answer: A

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3. Consider the two curves $C_1 : y^2 = 4x$, $C_2 : x^2 + y^2 - 6x + 1 = 0$. Then C_1 and C_2 touch each other only at one point C_1 and C_2 touch each other exactly at two point C_1 and C_2 interesect (but do not touch) at exactly two points. C_1 and C_2 neither intersect nor touch each other.

A. Statement-1 is True, Statement - 2 is true, Statement-2 is a correct explanation for Statement-1`

B. Statement-1 is True, Statement - 2 is true, Statement-2 is not a correct explanation for Statement-3

C. Statement-1 is True, Statement - 2 is False.

D. Statement-1 is True, Statement - 2 is True.

Answer: B

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4. Statement-1: Three normals can be drawn to the parabola $y^2 = 4ax$ through the point (a, a+1), if $a < 2.$

Statement-2: The point (a, a+1) lies outside the parabola $y^2 = 4x$ for all $a \neq 1 - .$

A. Statement-1 is True, Statement - 2 is true, Statement-2 is a correct explanation for Statement-1`

B. Statement-1 is True, Statement - 2 is true, Statement-2 is not a correct explanation for Statement-4

C. Statement-1 is True, Statement - 2 is False.

D. Statement-1 is False, Statement - 2 is True.

Answer: D

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5. Statement-1: Length of the common chord of the parabola $y^2 = 8x$ and the circle $x^2 + y^2 = 9$ is less than the length of the latusrectum of the parabola.

Statement-2: If vertex of a parabola lies at the point (a. 0) and the directrix is x + a = 0, then the focus of the parabola is at the point (2a, 0).

A. Statement-1 is True, Statement - 2 is true, Statement-2 is a correct explanation for Statement-1`

B. Statement-1 is True, Statement - 2 is true, Statement-2 is not a correct explanation for Statement-5

C. Statement-1 is True, Statement - 2 is False.

D. Statement-1 is True, Statement - 2 is True.

Answer: C

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6. Statement-1: $y+b=m_1(x+a)$ and $y+b=m_2(x+a)$ are perpendicular tangents to the parabola $y^2=4ax$.

Statement-2: The locus of the point of intersection of perpendicular tangents to a parabola is its directrix.

A. Statement-1 is True, Statement - 2 is true, Statement-2 is a correct explanation for Statement-1`

B. Statement-1 is True, Statement - 2 is true, Statement-2 is not a correct explanation for Statement-6

C. Statement-1 is True, Statement - 2 is False.

D. Statement-1 is True, Statement - 2 is True.

Answer: A

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7. Given : A circle, $2x^2 + 2y^2 = 5$ and a parabola, $y^2 = 4\sqrt{5}x$. Statement - I : An equation of a common tangent to these curves is $y = \mathrm{x} + \sqrt{5}$

Statement - II : If the line, $y = mx + \frac{\sqrt{5}}{m}(m \neq 0)$ is their common tangent, then m satisfies $m^4 - 3m^2 + 2 = 0$.

(1) Statement - I is True; Statement -II is true; Statement-II is not a correct explanation for Statement-I (2) Statement -I is True; Statement -II is False. (3) Statement -I is False; Statement -II is True (4) Statement -I is True; Statement -II is True; Statement-II is a correct explanation for Statement-I

A. Statement-1 is True, Statement - 2 is true, Statement-2 is a correct explanation for Statement-1`

B. Statement-1 is True, Statement - 2 is true, Statement-2 is not a correct explanation for Statement-7

C. Statement-1 is True, Statement - 2 is False.

D. Statement-1 is True, Statement - 2 is True.

Answer: B

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Exercise

1. If the focus and vertex of a parabola are the points (0, 2) and (0, 4), respectively, then find the equation

A. $y^2 = 8x + 32$

B. $y^2 = -8x + 32$

C. $x^2 + 8x = 32$

D. $x^2 - 8y = 32$

Answer: C

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2. Find the equation of the directrix of the parabola $x^2 - 4x - 3y + 10 = 0$

A. $y = -\frac{5}{4}$

B. $y = \frac{5}{4}$

C. $y = -\frac{3}{4}$

D. $x = \frac{5}{4}$

Answer: B

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3. If the vertex of a parabola is the point $(-3, 0)$ and the directrix is the line $x+5=0$, then find its equation.

A. $y^2=8(x+3)$

B. $x^2=8(x+3)$

C. $y^2=-8(x+3)$

D. $y^2=8(x+5)$

Answer: A

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4. Find the angle made by a double ordinate of length $8a$ at the vertex of the parabola $y^2 = 4ax$.

A. $\pi / 3$

B. $\pi / 2$

C. $\pi / 4$

D. $\pi / 6$

Answer: B

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5. Find the coordinates of points on the parabola $y^2 = 8x$ whose focal distance is 4.

A. $(1/2, \pm 2)$

B. $(1, \pm 2\sqrt{2})$

C. $(2, \pm 4)$

D. none of these

Answer: C

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

A. $4a\sqrt{3}$

B. $2a\sqrt{3}$

C. $16a\sqrt{3}$

D. $8a\sqrt{3}$

Answer: D

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7. The coordinates of the focus of the parabola

$x^2 - 4x - 8y - 4 = 0$

A. (0, 2)

B. (2, 1)

C. (1, 2)

D. (-2, -1)

Answer: B

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8. 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 $\frac{1}{8a}|(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$.

A. $\frac{1}{2a}|(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$

B. $\frac{1}{4a}|(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$

C. $\frac{1}{8a}|(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$

D. none of these

Answer: C

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9. The are of the triangel inscribed in the parabola $y^2 = 4x$ the ordinates of whose vertices are 1, 2 and 4 square units, is

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

B. $\frac{5}{2}$

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

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

Answer: D

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

A. 2

B. 1

C. 4

D. none of these

Answer: A

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11. The length of the latus rectum of the parabola whose focus is $\left(\frac{u^2}{2g}\sin 2\alpha, -\frac{u^2}{2g}\cos 2\alpha\right)$ and directrix is $y=\frac{u^2}{2g}$ is $\frac{u^2}{g}\cos^2\alpha$ (b) $\frac{u^2}{g}\cos^2 2\alpha$ $\frac{2u^2}{g}\cos^2 2\alpha$ (d) $\frac{2u^2}{g}\cos^2\alpha$

A. $\frac{u^2}{g}\cos^2\alpha$

B. $\frac{u^2}{g}\cos 2\alpha$

C. $\frac{2u^2}{g}\cos 2\alpha$

D. $\frac{2u^2}{g}\cos^2 \alpha$

Answer: D

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

A. $y^2 = ax$

B. $9y^2 = 4ax$

C. $9y^2 = ax$

D. $y^2 = 9ax$

Answer: B

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13. If the segment intercepted by the parabola $y = 4ax$ with the line $lx + my + n = 0$ subtends a right angle at the vertex, then

$4al + n = 0$ (b) $4al + 4am + n = 0$

$4am + n = 0$ (d) $al + n = 0$

A. 4 al+ n =0

B. 4al+4am +n =0

C. 4am+n=0

D. al+n=0

Answer: A

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14. The length of a focal chord of the parabola $y^2 = 4ax$ making an angle θ with the axis of the parabola is $(a > 0)$is:

A. $4a\text{cosec}^2\theta$

B. $4a\cos\theta\text{cosec}^2\theta$

C. $4a\cot\theta\text{cosec}^2\theta$

D. $2a\quad\text{cosec}^2\theta$

Answer: B

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15. Show that the parametric point $(2+t^2, 2t+1)$ represents a parabola. Show that its vertex is (2,1).

A. a parabola with focus at (2, 1)

B. a parabola with vertex at (2, 1)

C. an ellipse with centre at (2, 1)

D. none of these

Answer: B

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16. The ratio in which the line segment joining the point (4, -6) and (3, 1) si divided by the parabola $y^2 = 4ax$ is

A. $\frac{-20 \pm \sqrt{155}}{11} : 1$

B. $\frac{-2 \pm \sqrt{155}}{11} : 1$

C. $-20 \pm 2\sqrt{155} : 11$

D. $-20 \pm \sqrt{155} : 11$

Answer: C

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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) $2a = b$ (C) $a^2 = 2b$ (D) $2a = b^2$

A. a=ab

B. 2a=b

C. $a^2 = ab$

D. $2a = b^2$

Answer: D

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

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

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

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

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

Answer: C

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19. The locus of the middle points of the focal chord of the parabola $y^2 = 4ax$, is

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

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

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

D. none of these

Answer: B

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20. If y_1, y_2 are the ordinates of two points P and Q on the parabola and y_3 is the ordinate of the intersection of tangents at P and Q, then

A. y_1, y_2, y_3 are in AP

B. y_1, y_3, y_2 are in AP

C. y_1, y_2, y_3 are in GP

D. y_1, y_3, y_2 are in GP

Answer: B

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21. If the line $x + y = 1$ touches the parabola $y^2 - y + x = 0$, then the coordinates of the point of contact are:

A. (1, 1)

B. (1/2, 1/2)

C. (0, 1)

D. (1, 0)

Answer: C

22. 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. tangent at the vertex

C. x = a

D. none of these

Answer: B

Watch Video Solution

23. The equation to the line touching both the parabolas $y^2 = 4x$ and $x^2 = -32y$ is

A. x+2y+4=0

B. 2x+y-4=0

C. x-2y-4=0

D. x-2y+4=0

Answer: D

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24. If t is the parameter for one end of a focal chord of the parabola $y^2 = 4ax$, then its length is :

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

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

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

D. $a\left(t - \frac{1}{t}\right)$

Answer: A

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25. Find the equation of normal to the parabola $y^2 = 4ax$at point $(at^2, 2at)$

A. 1/t

B. t

C. $-t$

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

Answer: C

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26. The normal at the point $P\left(ap^2, 2ap\right)$ meets the parabola $y^2 = 4ax$ again at $Q\left(aq^2, 2aq\right)$ such that the lines joining the origin to P and Q are at right angle. Then (A) $p^2 = 2$ (B) $q^2 = 2$ (C) $p = 2q$ (D) $q = 2p$

A. $p^2 + pq + 2 = 0$

B. $p^2 - pq + 2 = 0$

C. $q^2 + pq + 2 = 0$

D. $p^2 + pq + 1 = 0$

Answer: A

Watch Video Solution

27. The length of the subnormal to the parabola $y^2 = 4ax$ at any point is equal to

A. $a\sqrt{2}$

B. $2\sqrt{2}a$

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

D. $2a$

Answer: D

Watch Video Solution

28. The two parabolas $y^2 = 4x$ and $x^2 = 4y$ intersect at a point P, whose abscissas is not zero, such that

A. they both touch each other at P

B. they cut at right angles at P

C. the tangents to each curvs at P make complementary angles with the x-axis

D. none of these

Answer: C

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29. A set of parallel chords of the parabola $y^2 = 4ax$ have their midpoint on any straight line through the vertex any straight line through the focus a straight line parallel to the axis another parabola

A. any straight line through the vertex

B. any straight line through the focus

C. a straight line parallel to the axis

D. another parabola

Answer: C

Watch Video Solution

30. Find the point on the curve $y^2 = ax$ the tangent at which makes an angle of 45^0 with the x-axis.

A. (a/2, a/4)

B. (-a/2, a/4)

C. (a/4, a/2)

D. (-a/4, a/2)

Answer: C

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31. The line $2x + y + \lambda = 0$ is a normal to the parabola $y^2 = -8x$, is λ=

A. -16

B. -8

C. -24

D. 24

Answer: D

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32. Find the angle at which the parabolas $y^2 = 4x$ and $x^2 = 32y$ intersect.

A. $\tan^{-1}(3/5)$

B. $\tan^{-2}(4/5)$

C. π

D. $\pi/2$

Answer: A

Watch Video Solution

33. The normal at $(a, 2a)$ on $y^2 = 4ax$ meets the curve again at $\left(at^2, 2at\right)$. Then the value of $t =$

A. 1

B. 3

C. -1

D. -3

Answer: D

Watch Video Solution

34. If a chord which is normal to the parabola at one end subtend a right angle at the vertex, then angle to the axis is

A. 1

B. 3

C. -1

D. -3

Answer: C

Watch Video Solution

35. Find the equations of the normals at the ends of the latus- rectum of the parabola $y^2 = 4ax$. Also prove that they are at right angles on the axis of the parabola.

A. $x^2 - y^2 - 6ax + 9a^2 = 0$

B. $x^2 - y^2 - 6ax - 6an + 9a^2 = 0$

C. $x^2 - y^2 - 6xy + 9a^2 = 0$

D. none of these

Answer: A

Watch Video Solution

36. The normal at the point $P(ap^2, 2ap)$ meets the parabola $y^2 = 4ax$ again at $Q(aq^2, 2aq)$ such that the lines joining the origin to P and Q are at right angle. Then (A) $p^2 = 2$ (B) $q^2 = 2$ (C) $p = 2q$ (D) $q = 2p$

A. $p^2 = 2$

B. $q^2 = 2$

C. $p = 2q$

D. $q = 2p$

Answer: A

Watch Video Solution

37. If the normals at points $t_1 and t_2$ meet on the parabola, then $t_1 t_2 = 1$ (b) $t_2 = -t_1 - \frac{2}{t_1}$ $t_1 t_2 = 2$ (d) none of these

A. $t_1 t_2 = -1$

B. $t_2 = -t_1 - \frac{2}{t_1}$

C. $t_1 t_2 = 2$

D. none of these

Answer: C

Watch Video Solution

38. 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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39. The angle between the tangents drawn from the origin to the paraboala $y^2 = 4a(x - a)$, is

A. 90°

B. 30°

C. $\tan^{-1}(1/2)$

D. 45°

Answer: A

Watch Video Solution

40. The angle between the tangents drawn from the point (-a, 2a) to y^2=4ax is

A. $\pi / 4$

B. $\pi / 2$

C. $\pi / 3$

D. $\pi / 6$

Answer: B

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41. The angle between the tangents to the parabola $y^2 = 4ax$ at the points where it intersects with the line $x - y - a = 0$ is $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) π (d) $\frac{\pi}{2}$

A. $\pi/3$

B. $\pi/4$

C. $\pi/6$

D. $\pi/2$

Answer: D

Watch Video Solution

42. P(-3, 2) is one end of focal chord PQ of the parabola $y^2 + 4x + 4y = 0$. Then the slope of the normal at Q is

A. $-1/2$

B. 2

C. $1/2$

D. -2

Answer: A

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43. If $x = my + c$ is a normal to the parabola $x^2 = 4ay$, then the value of c, is

A. $-2am - am^3$

B. $2am + am^3$

C. $-\frac{2a}{m} - \frac{a}{m^3}$

D. $\frac{2a}{m} + \frac{a}{m^3}$

Answer: A

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44. Find the equations of the tangent and the normal to the given curve at the indicated point :

$y^2 = 4ax \quad \text{at} \quad \left(\frac{a}{m^2}, \frac{2a}{m}\right)$

A. $y = mx - 2am - am^3$

B. $m^3 y = m^2 x - 2am^2 - a$

C. $m^3 y = 2am^2 - m^2 x + a$

D. none of these

Answer: C

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45. f the normal at the point $P(at_1, 2at_1)$ meets the parabola $y^2 = 4ax$ aguin at $(at_2, 2at_2)$, then

A. -1

B. -2

C. -3

D. -4

Answer: D

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46. If the vertex of the parabola $y = x^2 - 8x + c$ lies on x-axis, then the value of c, is

A. -16

B. -4

C. 4

D. 16

Answer: D

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47. If the chord $y = mx + c$ subtends a right angle at the vertex of the parabola $y^2 = 4ax$, thenthe value of c is

A. $-4am$

B. $4am$

C. $-2am$

D. $2am$

Answer: A

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48. The equation of the tangent at the vertex of the parabola $x^2 + 4x + 2y = 0,$ is

A. x=-2

B. x=2

C. x=a

D. x=-a

Answer: C

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49. The locus of the point of intersection of the perpendicular tangents to the parabola $x^2 = 4ay$ is .

A. y=a

B. y=-a

C. x=a

D. x=-a

Answer: B

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50. If $y = 2x + 3$ is a tangent to the parabola $y^2 = 24x$, then find its distance from the parallel normal.

A. $5\sqrt{5}$

B. $10\sqrt{5}$

C. $15\sqrt{5}$

D. $3\sqrt{5}$

Answer: C

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51. If the normal at(1, 2) on the parabola $y^2 = 4x$ meets the parabola again at the point $(t^2, 2t)$ then the value of t, is

A. 1

B. 3

C. -3

D. -1

Answer: C

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52. 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: B

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53. If the point P(4, -2) is the one end of the focal chord PQ of the parabola $y^2 = x$, then the slope of the tangent at Q, is

A. $-1/4$

B. $1/4$

C. 4

D. -4

Answer: C

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54. If PSQ is a focal chord of the parabola $y^2 = 8x$ such that $SP = 6$, then the length of SQ is 6 (b) 4 (c) 3 (d) none of these

A. 6

B. 4

C. 3

D. none of these

Answer: C

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55. The angle between the normals to the parabola $y^2 = 24x$ at points (6, 12) and (6, -12), is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D

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

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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57. The equation of the common tangent touching the circle $(x-3)^2+y^2=0$ and the parabola $y^2=4x$ above he x-axis is

A. $\sqrt{3}y=3x+1$

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

C. $\sqrt{3}y=(x+3)$

D. sqrt3y=-3x-1`

Answer: C

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58. The length of the subtangent to the parabola $y^2 = 16x$ at the point whose abscissa is 4, is

A. 2

B. 4

C. 8

D. none of these

Answer: C

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59. if P is a point on parabola $y^2 = 4ax$ such that subtangents and subnormals at P are equal, then the coordinates of P are:

A. (a, 2a) or (a, -2a)

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

C. $(4a, \ -4a)$ or $(4a, 4a)$

D. none of these

Answer: A

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60. The normal to the parabola $y^2 = 8ax$ at the point (2, 4) meets the parabola again at the point

A. (-18, -12)

B. (-28, 12)

C. (18, 12)

D. (18, -12)

Answer: D

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61. The graph represented by $x = \sin^2 t, y = 2\cos t$ is

A. a protion of a parabola

B. a part of a hyperbola

C. a part of a sing graph

D. a part of a hyperbola

Answer: B

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62. The subtangent, ordinate and subnormal to the parabola $y^2 = 4ax$ are in

A. AP

B. GP

C. HP

D. none of these

Answer: B

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63. f the normal at the point $P(at_1, 2at_1)$ meets the parabola $y^2 = 4ax$ aguin at $(at_2, 2at_2)$, then

A. $t_1t_2 = -1$

B. $t_1t_2 = 1$

C. $t_1t_2 = 2$

D. $t_2t_2 = -2$

Answer: A

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64. The equation of the parabola whose vertex is at(2, -1) and focus at(2, -3), is

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

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

C. $x^2 + 8y = 12$

D. $x^2 - 4x + 12 = 0$

Answer: B

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65. The ends of a line segment are $P(1, 3)$ and $Q(1, 1)$, R is a point on the line segment PQ such that $PR : QR = 1 : \lambda$.If R is an interior point of the parabola $y^2 = 4x$ then

A. (0, 1)

B. (-3/5, 1)

C. (1/2, 3/5)

D. none of these

Answer: A

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

A. $(1, \ -1)$

B. $(-2, 1)$

C. $(3/2, 1)$

D. $(-7/2, 1)$

Answer: B

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67. The Cartesian equation of the directrix of the parabola whose parametrix equations are $x = 2t + 1, y = t^2 + 2$, is

A. y = 2

B. y = 1

C. y = -1

D. y = -2

Answer: B

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68. If the vertex of a parabola is (0, 2) and the extremities of latusrectum are (-6, 4) and (6, 4) then, its equation, is

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

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

C. $x^2 - 8y + 16 = 0$

D. $x^2 + 8y - 16 = 0$

Answer: C

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69. A line L passing through the focus of the parabola $(y-2)^2 = 4(x+1)$ intersects the two distinct point. If m be the slope of the line l,, then

A. $\min(-\infty, -1) \cup (1, \infty)$

B. $m \in (-\infty, 0) \cup (0, \infty)$

C. $\min(-\infty, 0) \cup (0, \infty)$

D. none of these

Answer: C

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70. Let $y = f(x)$ be a parabola, having its axis parallel to the y-axis, which is touched by the line $y = x$ at $x = 1$. Then, $2f(0) = 1 - f'(0)$

(b) $f(0) + f'(0) + f^0 = 1$ $f'(1) = 1$ (d)

$f'(0) = f'(1)$

A. $f'(0) = '(1)$

B. $2f(0) = 1 - f'(0)$

C. $f'(1) = 1$

D. $f(0) + f'(0) + f'(0) = 1$

Answer: B

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71. If two tangents drawn from the point (α, β) to the parabola $y^2 = 4x$ are such that the slope of one tangent is double of the other, then prove that $\alpha = \frac{2}{9}\beta^2$.

A. $9y = 2x^2$

B. $9x = 2y^2$

C. $2x = 9y^2$

D. none of these

Answer: B

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72. The angle between the tangents drawn form the point (3, 4) to the parabola $y^2 - 2y + 4x = 0$, is

A. $\tan^{-1}(8\sqrt{5}/7)$

B. $\tan^{-1}(12/\sqrt{5})$

C. $\tan^{-1}(\sqrt{5}/7)$

D. none of these

Answer: A

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73. set of values of m for which a chord of slope m of the circle $x^2 + y^2 = 4$ touches parabola $y^2 = 4x$, may lie in intervel

A. $\left(-\infty, -\sqrt{\frac{\sqrt{2}/7}{2}}\right) \cup \left(\sqrt{\frac{\sqrt{2}-1}{2}}, \infty\right)$

B. $(-\infty, -1) \cup (1, \infty)$

C. $(-1, 1)$

D. R

Answer: A

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74. The mid-point of the line joining the common points of the line $2x - 3y + 8 = 0$ and $y^2 = 8x$, is

A. (3, 2)

B. (5, 6)

C. (4, -1)

D. (2, -3)

Answer: B

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75. Tangents PQ and PR are draqn to the parabola

$y^2 = 20(x+5)$ and $y^2 = 60(x+15)$

respectively such that $\angle RPQ = \frac{\pi}{2}$, the locus of point P, is

A. x+10=0

B. x+30=0

C. x+40=0

D. none of these

Answer: D

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76. PC is the normal at P to the parabola $y^2 = 4ax$, C being on the axis. CP is produced outwards to disothat $PQ = CP$; show that the locus of Q is a parabola.

A. ellipse

B. parabola

C. hyperbola

D. ciacle

Answer: B

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77. From a fixed point A three normals are drawn to the parabola $y^2 = 4ax$ at the points P, Q and R. Two circles C_1 and C_2 are drawn on AP and

AQ as diameter. If slope of the common chord of the circles C_1 and C_2 be m_1 and the slope of the tangent to teh parabola at R be m_2, then $m_1 \times m_2$, is equal to

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

B. 2

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

D. -2

Answer: A

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

Answer: C

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79. A circle drawn on any focal AB of the parabola $y^2 = 4ax$ as diameter cute the parabola again at C and D. If the parameters of the points A, B, C, D be t_1, t_2, t_3 and t_4 respectively, then the value of t_3, t_4, is

A. -1

B. 2

C. 3

D. none of these

Answer: C

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80. Let F be the focus of the parabola $y^2 = 4ax$ and M be the foot of perpendicular form point $P(at^2, 2at)$ on the tangent at the vertex. If N is a point on the tangent at P, then $\frac{MN}{FN}$ equals

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

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

C. 1

D. none of these

Answer: A

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81. The focus of a parabola is (0, 0) and vertex (1, 1). If two mutually perpendicular tangents can be drawn to a parabola from the circle $(x-2)^2+(y-3)^2=r^2$,then

A. $|r| > \frac{1}{\sqrt{2}}$

B. $r > \frac{1}{\sqrt{2}}$

C. $r = \frac{1}{\sqrt{2}}$

D. $|r| < \frac{1}{\sqrt{2}}$

Answer: A

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82. The point P on the parabola $y^2 = 4ax$ for which | PR-PQ | is maximum, where R(-a, 0) and Q (0, a) are two points,

A. (a, 2a)

B. (a, -2a)

C. (4a, 4a)

D. (4a, -4a)

Answer: A

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Chapter Test

1. If $y = 2x + k$ is a tangent to the curve $x^2 = 4y$, then k is equal to

A. 4

B. 43467

C. -4

D. $-1/2$

Answer: C

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2. The normal drawn at a point $\left(at_1^2, 2at_1\right)$ of the parabola $y^2 = 4ax$meets on the point $\left(ar_2^2, 2at_2\right)$ then

A. $t_1 = 2t_2$

B. $t_1^2 = 2t_2$

C. $t_1t_2 = 1$

D. none of these

Answer: D

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3. The mid-point of the chord $2x + y - 4 = 0$ of the parabola $y^2 = 4x$ is

A. (5/2, -1)

B. (-1, 5/2)

C. (3/2, -1)

D. none of these

Answer: A

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4. The two ends of latusrectum of a parabola are the points (3, 6) and (-5, 6). The focus, is

A. (1, 6)

B. (-1, 6)

C. (1, -6)

D. (-1, -6)

Answer: B

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5. Prove that the locus of the middle points of all chords of the parabola $y^2 = 4ax$ passing through the vertex is the parabola $y^2 = 2ax$.

A. $y^2 = 8x$

B. $y^2 = 2x$

C. $x^2 + 4y^2 = 16$

D. $x^2 = 2y$

Answer: B

Watch Video Solution

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

A. (4, 7/2)

B. (4, 9/2)

C. (9/2, 4)

D. (1, 0)

Answer: B

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7. The point of contact of the line x-2y-1=0 with the parabola $y^2 = 2(x - 3)$, is

A. (5, 2)

B. (5, -2)

C. (2, 5)

D. (5, 3)

Answer: A

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8. Find the number of distinct normals that can be drawn from $(-2, 1)$ to the parabola $y^2 - 4x - 2y - 3 = 0$

A. 3

B. 2

C. 1

D. 4

Answer: A

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9. At what point on the parabola $y^2 = 4x$ the normal makes equal angle with the axes? $(4, 4)$

(b) $(9, 6)$ (d) $(4, \ -4)$ (d) $(1, \ \pm 2)$

A. (4, 4)

B. (9, 6)

C. (4, -4)

D. (1, -2)

Answer: D

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10. Three normals to the parabola $y^2 = x$ are drawn through a point (C, O) then C=

A. $c = 1/4$

B. $c = 1/2$

C. $c < 1/2$

D. none of these

Answer: C

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11. The normal chord of a parabola $y^2 = 4ax$ at the point $P(x_1, x_1)$ subtends a right angle at the

A. focus

B. vertex

C. end of the latusrectum

D. none of these

Answer: A

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12. AB, AC are tangents to a parabola $y^2 = 4ax$; p_1, p_2, p_3 are the lengths of the perpendiculars from A, B, C on any tangents to the curve, then p_2, p_1, p_3 are in:

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

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13. The circles on the focal radii of a parabola as diameter touch: A) the tangent at the vertex B) the axis C) the directrix D) latus rectum

A. the tangent at the vertex

B. the axis

C. the directrix

D. none of these

Answer: A

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14. If the normals from any point to the parabola $y^2 = 4x$ cut the line $x = 2$ at points whose ordinates are in AP, then prove that the slopes of tangents at the co-normal points are in GP.

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

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15. 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. $(p/2, \pm p)$

B. $(p, p/2)$

C. $(-p/2, p)$

D. $(-p/2, -p)$

Answer: A

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16. The equation of the tangent to the parabola $y^2 = 8x$ which is perpendicular to the line $x - 3y + 8 = 0$, is

A. 9x+3y+2=0

B. 3x+y+2=0

C. 3x-y-1=0

D. 9x-3y+2-=0

Answer: A

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17. the tangent drawn at any point P to the parabola $y^2 = 4ax$ meets the directrix at the point K. Then the angle which KP subtends at the focus is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D

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18. The tangent and normal at $P(t)$, for all real positive t, to the parabola $y^2 = 4ax$ meet the axis of the parabola in T and G respectively, then the angle at which the tangent at P to the parabola is inclined to the tangent at P to the circle passing through the points P, T and G is

A. $\tan^{-1}(t^2)$

B. $\cot^{-1})(t^2)$

C. $\tan^{-1}(t)$

D. $\cot^{-1}(t)$

Answer: C

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19. The parabola $y^2 = 4ax$ passes through the point (2, -6), then the length of its latusrectum, is

A. 18

B. 9

C. 6

D. 16

Answer: A

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20. A variable circle passes through the fixed point (2, 0) and touches y-axis Then, the locus of its centre, is

A. a parabola

B. a circle

C. an ellipse

D. a hyperbola

Answer: A

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21. The locus of the middle points of the focal chords of the parabola, $y^2 = 4x$ is:

A. the axis

B. a focal chord

C. the directrix

D. the tangent at the vertex

Answer: C

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22. If the lsope of the focal chord of $y^2 = 16x$ is 2, then the length of the chord, is

A. 22

B. 24

C. 20

D. 18

Answer: C

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23. If x-2y-a=0 is a chord of the parabola $y^2 = 4ax$, then its langth, is

A. $4a\sqrt{5}$

B. $40a$

C. $20a$

D. $15a$

Answer: C

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24. Equation of normal to the parabola $y^2 = 4x$ which passes through (3, 0), is

A. x+y=3

B. x+y+3=0

C. x-2y=3

D. none of these

Answer: A

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25. Find the length of normal chord which subtends an angle of 90^0 at the vertex of the parabola $y^2 = 4x$.

A. $6\sqrt{3}$

B. $3\sqrt{3}$

C. 2

D. 1

Answer: A

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26. At what point on the parabola $y^2 = 4x$ the normal makes equal angle with the axes? $(4, 4)$ (b) $(9, 6)$ (d) $(4, -4)$ (d) $(1, \pm 2)$

A. (4, 4)

B. (9, 0)

C. (4, -4)

D. (1, -2)

Answer: D

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27. The circles on the focal radii of a parabola as diameter touch: A) the tangent at the vertex B) the axis C) the directrix D) latus rectum

A. axis

B. directrix

C. tangent at the vertex

D. none of these

Answer: C

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28. Tangents are drawn at the ends of any focal chord of the parabola $y^2 = 16x$. Then which of the following statements about the point of intersection of tangents is true.

A. its abscissa is independent of the extremities of the focal chord

B. its ordinate is independent of the extremities of the focal chord

C. it is at a distance of 8 units from the vertex of the parabola

D. It is at a distance of 16 units from the focus of the parabola

Answer: A

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29. The angle between the pair of tangents drawn form (1, 3) to the parabola $y^2 = 8x$, is

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

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

C. $\tan^{-1}\left(\frac{1}{3}\right)$

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

Answer: C

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30. A variable tangent to the parabola $y^2 = 4ax$ meets the parabola $y^2 = -4ax$ P and Q. The locus of the mid-point of PQ, is

A. $y^2 = -2ax$

B. $y^2 = -ax$

C. $y^2 = -\frac{4}{3}ax$

D. $y^2 = -4ax$

Answer: C

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