MATHS

BOOKS - ML KHANNA

THE PARABOLA

Problem Set 1 Multiple Choice Questions

1. The co-ordinates of a point on the parabola $y^2 = 8x$ whose focal distance is 4 is

A. (2, 4)

B. (4,2)

C. (2, -4)

D. (4,-2)

Answer: A::C

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

A. $2a\sqrt{3}$

B. $4a\sqrt{3}$

C. $6a\sqrt{3}$

D. $8a\sqrt{3}$

Answer: D

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3. In the parabola $y^2 = 4ax$, the length of the chord passing through the vertex and inclined to the x-axis at an angle θ is

A. $4a\cos\theta/\sin^2\theta$

B. $4a\cos\theta/\cos^2\theta$

C. $a\sec^2\theta$

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

Answer: A::C

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4. In the parabola $y^2 = 4ax$, the length of the chord passing through the vertex and inclined to the axis at an angle

A. $4a\sqrt{2}$

B. $4a/\sqrt{2}$

C. $2a\sqrt{2}$

D. None of these

Answer: A

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5. A square has one vertex at the vertex of the parabola $y^2 = 4ax$ and the diagonal through the vertex lies along the axis of the parabola. If the ends of the other diagonal lie on the parabola, the coordinates of the vertices of the square are $(4a, 4a)$ (b) $(4a, -4a)$ $(0, 0)$ (d) $(8a, 0)$

A. $(4a, 4a)$

B. $(4a - 4a)$

C. $(0, 0)$

D. $(8a, 0)$

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

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6. 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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7. Focus of the parabola $5x^2 + 30x + 2y + 59 = 0$ is

A. (-3,- 7)

B. $(-3, -7)$

C. $\left(-3, -\frac{71}{10}\right)$

D. none

Answer: B

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8. Co-ordinates of the focus of the parabola $x^2 - 4x - 8y - 4 = 0$ are

A. $(0, 2)$

B. $(2, 1)$

C. $(1, 2)$

D. $(-2, -1)$

Answer: B

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9. The vertex of the parabola $x^2 + 2y = 8x - 7$ is

A. $\left(4, \frac{7}{2}\right)$

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

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

D. $(1, 0)$

Answer: B

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10. The extremities of latus rectum of the parabola $(y-1)^2 = 2(x+2)$ are

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

B. $(-2, 1)$

C. $\left(-\frac{3}{2}, 0\right)$

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

Answer: A::C

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11. The equation of parabola is given by $y^2 + 8x - 12y + 20 = 0$. Tick the correct options given below

A. vertex $(2, 6)$

B. focus $(0, 6)$

C. latus rectum 4

D. axis y = 6

Answer: A::B::D

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12. The length of latus rectum of the parabola $x^2 - 4x - 8y + 12 = 0$ is :

A. 4

B. 6

C. 8

D. 10

Answer: C

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13. If $(2, 0)$ is the vertex and the $y-$ axis is the directrix of a parabola, then where is its focus?

A. $(2, 0)$

B. $(-2, 0)$

C. $(4, 0)$

D. $(-4, 0)$

Answer: C

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14. The two ends of latus rectum 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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15. The equation of the directrix of the parabola $y^2 + 4y + 4x + 2 = 0$ is

$x = -1$ (b) $x = 1$ $x = -\frac{3}{2}$ (d) $x = \frac{3}{2}$

A. $x = -1$

B. $x = 1$

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

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

Answer: D

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16. 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. $1/4$

Answer: C

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17. If $ax^2 + 4xy + y^2 + ax + 3y + 2 = 0$ represents a parabola, then a =

A. -4

B. 4

C. 0

D. none

Answer: B

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18. The locus of the mid-point of the line segment joning the focus to a moving point on the parabola $y^2 = 4ax$ is another parabola with directrix

A. $x = -a$

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

C. $x = 0$

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

Answer: C

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19. If $(0, 4)$ and $(0, 2)$ are respectively the vertex and focus of a parabola, then its equation is

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

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

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

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

Answer: A

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20. The equation of the parabola whose vertex is $(2, 0)$ and extremities of latus rectum are $(3, 2)$ and $(3, -2)$ is

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

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

C. $x^2 = 4y - 3$

D. none

Answer: B

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21. The equation $y^2 - 2x - 2y + 5 = 0$ represents

A. circle centred at $(1, 1)$

B. parabola with directix at $x = \frac{3}{2}$

C. parabola with vertex at $(2, 1)$

D. parabola with directix at $x = -\frac{1}{2}$

Answer: C

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

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

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

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

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

Answer: A

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

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

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

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

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

Answer: D

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24. A parabola has the origin as its focus and the line x=2 as the directrix.

The vertex of the parabola is at

A. $(0, 2)$

B. $(1, 0)$

C. $(0, 1)$

D. $(2, 0)$

Answer: B

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25. The equation of the parabola whose vertex and focus lie on the axis of xat distances aand a_1 from the origin respectively, is

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

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

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

D. none of these

Answer: B

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26. The vertex of a parabola is the point (a,b) and latus rectum is of length I. 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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27. The length of the latus rectum of the parabola $169\left\{(x-1)^2+(y-3)^2\right\} = (5x-12y+17)^2$ is

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

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

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

D. none

Answer: C

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28. The parametric representation $(2 + t^2, 2t + 1)$ represents

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

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

C. an ellipse with center at $(2, 1)$

D. none of these

Answer: B

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

A. a pair of straight lines

B. an ellipse

C. a parabola

D. a hyperbola

Answer: C

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30. The curve represented by the equations $x = \sin^2\theta, y = 2\cos\theta$ is

A. ellipse

B. parabola

C. hyperbola

D. none

Answer: B

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

A. $\pi/3$

B. $\pi/2$

C. $\pi/4$

D. $\pi/6$

Answer: B

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32. If the segment intercepted by the parabola $y^2 = 4ax$ with the line $lx + my + n = 0$ subtends a right angle at the vertex then:

A. $4al + n = 0$

B. $4al + 4am + n = 0$

C. $4am + n = 0$

D. $al + n = 0$

Answer: A

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33. The ratio in which the line segment joining the points $(4, -6)$ and $(3, 1)$ is divided by the parabola $y^2 = 4x$, 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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34. Equation of the parabola whose axis is $y = x$ distance from origin to vertex is $\sqrt{2}$ and distance from origin to focus is $2\sqrt{2}$, is (Focus and vertex lie in Ist quadrant):

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

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

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

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

Answer: B

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

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

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

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

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

Answer: C::D

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

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

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

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

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

Answer: A

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37. STATEMENT-1 : The curve $y = \frac{-x^2}{2} + x + 1$ is symmetric with respect to the line $x = 1$. because STATEMENT-2 : A parabola is symmetric about

its axis.

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38. Consider the two curves $C_1 : y^2 = 4x_1, C_2 : x^2 + y^2 - 6x + 1 = 0.$ Then,

A. C_1 and C_2 touch each other only at one point

B. C_1 and C_2 touch each other exactly at two points

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

D. C_1 and C_2 neither intersect nor touch each other

Answer: B

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Problem Set 1 True And False

1. The equation of the parabola whose focus is at the origine is $y^2 = 4a(x + a)$.

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2. The locus of the mid-point of the chords of the parabola $y^2 = 4ax$ which pass through the vertex is the parabola $y^2 = 2ax$.

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Problem Set 1 Fill In The Blanks

1. The equation of the parabloa whose fouce is thepoint $(2, 3)$ and directirix is the line $x - 4y + 3 = 0$ is ..... and the lenght of its latus rectum is .....

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2. For the parabola $y^2 + 4x - 6y + 13 = 0$, the vertex is .... force is ... directrix is ... L.R , is .....

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Problem Set 2 Multiple Choice Questions

1. The line lx+ my +n=0 will touch the parabola $y^2 = 4ax$ if

A. $lm = an^2$

B. $mn = al^2$

C. $nl = am^2$

D. none

Answer: C

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2. The straight line $y = x + 2a$ touches the parabola $y^2 = 4a(x + a)$ at the point

A. $(-a, a)$

B. $(0, 2a)$

C. $(-2a, 0)$

D. $(a, 3a)$

Answer: B

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3. The straight line $x + y = a$ touches the parabola $y = x - x^2$ If a =

A. 0

B. 1

C. -1

D. none

Answer: B

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4. The line y = mx + 1 is a tangent to the parabola $y^2 = 4x$

A. $m = 1$

B. $m = 2$

C. $m = 4$

D. $m = 3$

Answer: A

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5. Two straight lines are perpendicular to each other. One of them touches the parabola $y^2 = 4a(x + a)$ and the other touches

$y^2 = 4b(x + b)$. Their point of intersection lies on the line. $x - a + b = 0$ (b) $x + a - b = 0$ $x + a + b = 0$ (d) $x - a - b = 0$

A. $x - a + b = 0$

B. $x + a - b = 0$

C. $x + a + b = 0$

D. $x - a - b = 0$

Answer: C

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6. Let P be the point $(1, 0)$ and Q a point on the locus $y^2 = 8x$. The locus of mid-point 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: C

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7. If a tangent to the parabola $y^2 = ax$ makes an angle 45° with x-axis, its point of contact will be

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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8. The point on the curve $y^2 = x$, the tangent at which makes an angle 45° with x-axis will be given by

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

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

C. $(2, 4)$

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

Answer: D

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9. The portion of a tangent to a parabola cut off between the directrix and the curve subtends at the focus an angle

A. 45°

B. 60°

C. 90°

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

Answer: C

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10. $y = x + 2$ is any tangent to the parabola $y^2 = 8x$. The point P on this tangent is such that the other tangent from it which is perpendicular to it is $(2, 4)$ (b) $(-2, 0)$ $(-1, 1)$ (d) $(2, 0)$

A. $(2, 4)$

B. $(-2, 0)$

C. $(-1, 1)$

D. $(2, 0)$

Answer: B

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

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

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

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

D. none of these

Answer: B

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

A. $1, -1$

B. $-1/2, 2$

C. $-2, 1/2$

D. $1/2, 2$

Answer: A

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13. The locus of point from which the two tangents drawn to a parabola be such that slope of one is thrice of the other is

A. line

B. circle

C. parabola

D. ellipse

Answer: C

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14. If the chord of contact of tangents from a point P to the parabola $y^2 = 4ax$ touches the parabola $x^2 = 4by$ then the locus of P is

A. circle

B. parabola

C. ellipse

D. hyperbola

Answer: D

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15. Tangents are drawn from the point P to the parabola $y^2 = 8x$ such that slope of one tangent is twice the slope of the other. The locus of Pis

A. line

B. circle

C. parabola

D. ellipse .

Answer: C

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16. Two tangents are drawn from the point $(-2, -1)$ to the parabola $y^2 = 4x$. If θ is the angle between these tangents then $\tan\theta$ =

A. $1/2$

B. $1/3$

C. 2

D. 3

Answer: D

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17. If $y + 3 = m_1(x + 2)$ and $y + 3 = m_2(x + 2)$ are two tangents to the parabola $y^2 = 8x$, then

A. $m_1 + m_2 = 0$

B. $m_1 m_2 = -1$

C. $m_1 m_2 = 1$

D. none

Answer: B

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18. The equations of common tangent to the parabola $y^2 = 4ax$ and $x^2 = 4by$ is

A. $xa^{1/3} + yb^{1/3} + (ab)^{2/3} = 0$

B. $\frac{x}{a^{1/3}} + \frac{y}{b^{1/3}} + \frac{1}{(ab)^{2/3}} = 0$

C. $xb^{1/3} + ya^{1/3} - (ab)^{2/3} = 0$

D. $\frac{x}{b^{1/3}} + \frac{y}{a^{1/3}} + \frac{1}{(ab)^{2/3}} = 0$

Answer: A

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19. If the line $x + y = 1$ touches the parabola $y^2 - y + x = 0$, then the co-ordinates of the point of contactare

A. $(1, 1)$

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

C. $(0, 1)$

D. $(1, 0)$

Answer: C

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20. The point of intersection of the tangents at the ends of the latus rectum of the prabola $y^2 = 4x$ is

A. $(-1, -1)$

B. $(0, -1)$

C. $(-1, 0)$

D. $(1, 1)$

Answer: C

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21. The equation of tangents to the parabola $y^2 = 4ax$ at the ends of latus rectum is :

A. $x - y + a = 0$

B. $x + y + a = 0$

C. $x + y - a = 0$

D. both (a) and (b)

Answer: D

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22. Two tangents of the parabola $y^2 = 8x$, meet the tangent at its vertex in the points P and Q.If $PQ = 4$, locus of the point of intersection of the two tangents is

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

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

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

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

Answer: A

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23. 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 the mid-point of QR is

A. $(4, 2)$

B. $(2, 4)$

C. $(7, 9)$

D. none

Answer: B

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24. The locus of the point of intersection of tangents to the parabola $y^2 = 4(x + 1)$ and $y^2 = 8(x + 2)$ which are perpendicular to each other is

A. $x + 7 = 0$

B. $x + 3 = 0$

C. $x - y - 4 = 0$

D. $x - y + 12 = 0$

Answer: B

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25. 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 A.P.

B. y_1, y_3, y_2 are in A.P.

C. y_1, y_2, y_3 are in G.P

D. y_1, y_3, y_2 are in G.P.

Answer: B

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26. Ordinates of three points A,B,C on the parabola $y^2 = 4ax$ are in G.P. Tangents at A and C intersect on

A. line through B parallel to x-axis

B. line through B|| to y-axis

C. line through B and vertex of parabola

D. line through B and focus of parabola

Answer: B

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27. If the tangents at P and Q on a parabola meet in T, then SP, ST and SQ are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: B

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28. The tangent at P to a parabola meets the tangents at the vertex A in Q and S is the focus, then SP, SQ and SA are in

A. $A.\ P.$

B. $G.\ P.$

C. $H.\ P.$

D. None

Answer: B

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29. If b and c are the lengths of the segments of any focal chord of a parabola $y^2 = 4ax$, then the length of the semi-latus rectum is

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

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

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

D. $\sqrt{bc}$

Answer: C

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30. If b,c are the segments of a focal chord of the parabola $y^2 = 4ax$, then c is equal to

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

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

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

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

Answer: A

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

A. $6/5$

B. $12/5$

C. $24/5$

D. none

Answer: C

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32. If PSQ is focal chord of the parabola $y^2 = 8x$ such that $SP = 6$, then the length SQ is

A. 3

B. 4

C. 6

D. none

Answer: A

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33. If A_1B_2 and A_2B_2 are two focal chords of the parabola $y^2 = 4ax$ then the chords A_1A_2 and B_1B_2 intersect on

A. directrix

B. axis

C. T.V.

D. none

Answer: A

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34. If a focal chord of the parabola be at a distanced from the vertex, then its length is equal to

A. $\frac{2a^2}{d}$

B. $\frac{a^2}{d^2}$

C. $\frac{4a^3}{d^2}$

D. $\frac{d^2}{a}$

Answer: C

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35. Tangents at the extremities of a focal chord of a parabola intersect on the line

A. directrix

B. tangent at vertex

C. axis of parabola

D. none

Answer: A

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36. 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 $t_1, t_2, t_3 \text{ and } t_4$ respectively, then the value of t_3, t_4, is

A. -1

B. 2

C. 3

D. none

Answer: C

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37. The tangents at the points $\left(at_1^2, 2at_1\right), \left(at_2^2, 2at_2\right)$ on the parabola $y^2 = 4ax$ are at right angles if

A. $t_1t_2 = -1$

B. $t_1t_2 = 1$

C. $t_1t_2 = 2$

D. $t_1t_2 = -2$

Answer: A

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38. If two tanents drawn from a point P to the parabola $y^2 = 4x$ are at right angles, then the locus of P is

A. $2x + 1 = 0$

B. $x = -1$

C. $2x-1 = 0$

D. $x = 1$

Answer: B

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

A. $m_1 m_2 = -1$

B. $m_1 m_2 = 1$

C. $m_1 + m_2 = 0$

D. none

Answer: A

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40. Any two perpendicular tangents to a parabola intersect on the

A. directrix

B. tangent at vertex

C. axis of parabola

D. none

Answer: A

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41. A chord of the parabola $y^2 = 4ax$ subtends a right angle at the vertex. The locus of the point of intersection of tangents at its extremities is

A. $x + a = 0$

B. $x + 2a = 0$

C. $x + 4a = 0$

D. none

Answer: C

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42. The angle between tangents to the parabola $y^2 = 4ax$ at the point where it intersects with the line $x - y - a = 0$

A. $\pi/3$

B. $\pi/4$

C. $\pi/6$

D. $\pi/2$

Answer: D

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43. If $P\left(at_1^2, 2at_1\right)$ and $Q\left(at_2^2, 2at_2\right)$ are two variablé points on the curve $y^2 = 4ax$ and PQ subtends a right angle at the vertex, then t_1t_2 , is equal to

A. -1

B. -2

C. -3

D. -4

Answer: D

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44. 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. $-\frac{1}{4}$

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

C. 4

D. -4

Answer: C

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

A. $(-2, 8)$

B. $(32, -32)$

C. $(32, 32)$

D. none

Answer: C

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

A. 90°

B. 30°

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

D. 45°

Answer: A

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

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

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

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

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

Answer: C

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48. Two tangents are drawn from the point $(-2, -1)$ to the parabola $y^2 = 4x$. If a is the angle between these tangents, then α =

A. 3

B. $1/3$

C. 2

D. $1/2$

Answer: A

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49. Any tangent to a parabola $y^2 = 4ax$ and perpendicular to it from the focus meet on the line

A. $x = 0$

B. $y = 0$

C. $x = -a$

D. $y = -a$

Answer: A

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

A. they touch each other at P

B. they cut at right angles at P

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

D. none of these

Answer: C

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51. 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. $(p/2, p)$

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

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

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

Answer: A::B

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52. 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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53. If $y = 2x + 3$ is a tangent to the parabola $y^2 = 24x,$ then is distance from the parallel normal is $5\sqrt{5}$ (b) $10\sqrt{5}$ (c) $15\sqrt{5}$ (d) None of these

A. $5\sqrt{5}$

B. $10\sqrt{5}$

C. $15\sqrt{5}$

D. none of these

Answer: C

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54. TP, TQ are tangents to a parabola $y^2 = 4ax$, p_1, p_2, p_3 are the lengths of the perpendiculars from P,T,Q respectively on any tangent to the curve, then p_1, p_2, p_3 are in

A. A.P.

B. G.P.

C. H.P.

D. None of these

Answer: B

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55. The equation of the common tangent touching the circle $(x-3)^2+y^2=9$ and the parabola $y^2=4x$ above the x-axis is $\sqrt{3}y=3x+1$ (b) $\sqrt{3}y=-(x+3)$ $\sqrt{2}y=x+3$ (d) $\sqrt{3}y=-(3x-1)$

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

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

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

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

Answer: C

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56. Two parabolas $y^2=4a(x-\lambda)$ and $x^2=4a(y-\mu)$ always touch each other, then the point of contact lies on (λ, μ being parameters).

A. straight line

B. circle

C. parabola

D. hyperbola

Answer: D

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57. If the circle $x^2 + y^2 + 2\lambda x = 0, \lambda \in$ R touches the parabola $y^2 = 4x$ externally, then

A. $\lambda = 1$

B. $\lambda > 1$

C. $\lambda > 0$

D. $\lambda < 0$

Answer: C

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58. The equation of the common tangent to the curve $y^2 = 8x$ and $xy = -1$ is

A. $3y = 9x + 2$

B. $y = 2x + 1$

C. $2y = x + 8$

D. $y = x + 2$

Answer: D

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59. The equation to the common tangent to the parabolas $y^2 = 2x$ and $x^2 = 16y$ is

A. $2x + y + 1 = 0$

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

C. $x + y + 3 = 0$

D. $x - y + 4 = 0$

Answer: B

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60. Equations of the common tangents of the circles $x^2 + y^2 = 2a^2$ and the parabola $y^2 = 8ax$ are

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

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

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

D. none

Answer: A::B

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61. The common tangent(s) of $y = x^2$ and $y = -x^2 + 4x - 4$ is (are) :

A. $y = 4(x - 1)$

B. $y = -4(x - 1)$

C. $y = 0$

D. $y = 30x - 20$

Answer: B

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62. If the line $y = x\sqrt{3} - 3$ cuts the parabola $y^2 = x + 2$ at Pand Q and if A be the point $(\sqrt{3}, 0)$, then $AP.\ AQ$ is

A. $\frac{2}{3}(\sqrt{3} + 2)$

B. $\frac{4}{3}(\sqrt{3} + 2)$

C. $\frac{4}{3}(2 - \sqrt{3})$

D. $2\sqrt{3}$

Answer: B

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63. The ratio of area of triangle inscribed in a parabola to the area of the triangle formed by the tangents at the vertices of the triangle is

A. 1

B. 2

C. 1/2

D. none

Answer: B

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64. If perpendiculars be drawn from any two fixed points on the axis of a parabola at a distance d from the focus on any tangent to it, then the difference of their squares is

A. $a^2 - d^2$

B. $a^2 + d^2$

C. $4ad$

D. $2ad$

Answer: C

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65. A tangent and a normal are drawn at the point P $(16, 16)$ of the parabola $y^2 = 16x$ which cut the axis of the parabola at the points A and B respectively. If the centre of the through P, A and B is C, then angle between PC and axis of x is :

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

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

C. $\tan^{-1}\frac{3}{4}$

D. $\tan^{-1}\frac{4}{3}$

Answer: D

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Problem Set 2 True And False

1. The circle drawn on any focal chord of a parabola as diameter touches the directrix.

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Problem Set 2 Fill In The Blanks

1. The equations of tangents to the parabola $y^2 = 16x$ which are parallel and perpendicular to the line la to $2x - y + 5 = 0$ are ..... and .....

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2. The equations of tangents drawn to $y^2 + 12x = 0$ from the paint (3, 8) are .....

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3. L, M, N are three points on the parabola $y^2 = 40x$ whose ordinates are in geometrical progression. The oints tangents at L and N will meet on .....

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4. The equation of tangent to the parabola $y^2 = 4x + 5$ which is parallel to the line y = 2x +7 is .....

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5. The area of the triangle formed by three tangents to a point parabola $y^2 = 4ax$, if it is given that their slopes are in H.P. is .....

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Problem Set 3 Multiple Choice Questions

1. The distance between a tangent to the parabola $y^2 = 4ax$ which is inclined to axis at an angle α to X axis. and a parallel normal is

A. $\frac{a\cos\alpha}{\sin^2\alpha}$

B. $\frac{a\sin\alpha}{\cos^2\alpha}$

C. $\frac{a}{\sin\alpha\cos^2\alpha}$

D. $\frac{a}{\cos\alpha\sin^2\alpha}$

Answer: C

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2. If a normal chord of a parabola $y^2 = 4ax$ subtends a right angle at the vertex, then it is inclined at angle θ with the axis such that $\tan^2\theta$

A. $1/2$

B. $3/4$

C. 2

D. 4

Answer: C

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3. What is the slope of the normal at the point $\left(at^2, 2at\right)$ of the parabola $y^2 = 4ax$?

A. $1/t$

B. t

C. $-t$

D. $-1/t$

Answer: C

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

A. 12

B. -12

C. 24

D. -24

Answer: C

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5. The line $x + y = 6$ is a normal to the parabola $y^2 = 8$ x at , the point

A. (2, 4)

B. (2, - 4)

C. (18, – 12)

D. (18,12)

Answer: A

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6. At what point on the parabola $y^2 = 4x$ the normal, makes equal angles with axes

A. (4,4)

B. (9,6)

C. (4, -4)

D. (1,-2)

Answer: D

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7. PNP is a double ordinate of the parabola $y^2 = 4ax$ then the normal at P and a line parallel to the axis through P meet on the parabola

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

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

C. $y^2 = 2a(x + a)$

D. none

Answer: D

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8. If $x + y = k$ is normal to $y^2 = 12x,$ then k is 3 (b) 9 (c) -9 (d) -3

A. 3

B. 9

C. -9

D. -3

Answer: B

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

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D

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11. The line lx+ my +n=0 will touch the parabola $y^2 = 4ax$ if

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

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

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

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

Answer: A

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12. Three normals to the parabola $y^2=x$ are drawn through a point (c,0), then

A. $c=1/4$

B. $c=1/2$

C. $c>1/2$

D. none of these

Answer: C

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13. The number of distinct normals that can be drawn to the parabola $y^2 = 4x$ from the point $\left(\frac{11}{4}, \frac{1}{4}\right)$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

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14. If two of the feet of normals drawn.from a point to the parabola $y^2 = 4x$ be (1, 2) and (1, -2), then the third foot is

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

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

C. (0,0)

D. none

Answer: C

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

A. $t_1 = 2t_2$

B. $t_1^2 = 2t_2$

C. $t_1 . t_2 = 1$

D. $t_1^2 + t_1 t_2 + 2 = 0$

Answer: D

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

A. $6\sqrt{3}$

B. $7\sqrt{2}$

C. $8\sqrt{2}$

D. $9\sqrt{2}$

Answer: A

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17. The shortest distance between the lines $y - x = 1$ and the curve $x = y^2$ is

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

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

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

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

Answer:

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18. The normal chord of the parabola $y^2 = 4ax$ at a point whose ordinate is equal to abscissą subtends a right angle at the

A. focus

B. vertex

C. ends of latus rectum

D. none

Answer: A

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19. If the normal to the parabola $y^2 = 4ax$ at the point $P(\text{at}^2 2at)$ cuts the parabola again at Q $(aT^2, 2aT)$ then

A. $-2 \leq T \leq 2$

B. $T \in (-\infty, -8) \cup (8, \infty)$

C. $T^2 > 8$

D. $T^2 \geq 8$

Answer: D

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20. 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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21. The normal at the point $P\left(at_1^2, 2at_1\right)$ meets the parabola $y^2 = 4ax$ again at Q $\left(at_2^2, 2at_2\right)$ such that the lines joining the origin to P and Q are at right angle, then

A. $t_1^2 = 2$

B. $t_2^2 = 2$

C. $t_1 = 2t_2$

D. $t_2 = 2t_1$

Answer: A

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22. If a normal chord subtends a right angle at the vertex of the parabola $y^2 = 4ax$, then it is inclined to the axis at an angle

A. $\pi/2$

B. $\pi/4$

C. $\tan^{-1}\sqrt{3}$

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

Answer: D

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23. If the normals at points $'t_1'$ and $'t_2'$ meet on the parabola, then

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

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24. The equation of a normal to the parabola $y = x^2 - 6x + 6$ which is perpendicular to the line joining the origin to the vertex of the parabola is

A. $4x - 4y - 11 = 0$

B. $4x - 4y + 21 = 0$

C. $4x - 4y + 1 = 0$

D. $4x - 4y - 21 = 0$

Answer: D

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

A. $a\left\{t_1 + \frac{1}{t_1}\right\}^2$

B. $a\left\{t_1 - \frac{1}{t_1}\right\}^2$

C. $2at_1$

D. $2a/t_1$

Answer: A

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27. A triangle ABC of area Δ is inscribed in the parabola $y^2 = 4ax$ such that the vertex A lies at the vertex of the parabola and BC is a focal chord. The differences of the distances of B and C from the axis of the parabola is

A. $\frac{2\Delta}{a}$

B. $\frac{2\Delta}{a^2}$

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

D. none of these

Answer: A

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28. The locus of the middle points of the focal chord of the parabola y^2ax , 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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29. The locus of the poles of focal chords of the parabola $y^2 = 4ax$ is

A. $x = 0$

B. $x = -a$

C. $x = 2a$

D. $y = 0$

Answer: B

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30. A focal chord of parabola $y^2 = 4x$ .is inclined at an angle of $\frac{\pi}{4}$ with positive x -direction then the slope of normal drawn at the ends of chord will satisfy the equation

$(A)m^2 - 2m - 1 = 0(B)m^2 + 2m - 1 = 0(C)m^2 - 1 = 0(D)m^2 + 2m -$

A. $m^2 - 2m - 1 = 0$

B. $m^2 + 2m - 1 = 0$

C. $m^2 - 1 = 0$

D. none

Answer: B

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31. 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. $a/\sqrt{2}$

D. $2a$

Answer: D

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

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

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

C. $y^2 = 0(x - 2a)$

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

Answer: B

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33. 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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34. 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. A.P.

B. G.P.

C. H.P.

D. None of these

Answer: B

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35. The locus of the mid-points of the portion of the normal to the parabola $y^2 = 4ax$ intercepted between the curve and the axis is another parabola

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

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

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

D. none

Answer: C

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36. Through the vertex O of a parabola $y^2 = 4x$ chords OP and OQ are drawn at right angles to one-another. Then for all positions of P, PQ cuts the axis of the parabola at a fixed point and the locus of the middle point of PQ is

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

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

C. $y^2 = 2(x - 6)$

D. none

Answer: A

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37. Tangents are drawn from any point on the line $x + 4a = 0$ to the parabola $y^2 = 4ax$ The angle subtanded by their chord of contact at the vertex is

A. $\pi / 3$

B. $\pi / 4$

C. $\pi / 2$

D. none

Answer: C

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38. A is a point on the parabola $y^2 = 4ax$ The normal at A cuts the parabola again at the point B. If AB subtends a right angle at the vertex of the parabola, then the slope of AB is

A. ± 1

B. $\pm \sqrt{2}$

C. $\pm \sqrt{3}$

D. none

Answer: B

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39. The length of the normal chord to the parabola $y^2 = 4x$ which subtends a right angle at the vertex is

A. 1

B. 2

C. $3\sqrt{3}$

D. $6\sqrt{3}$

Answer: D

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40. A variable chord PQ of the parabola $y^2 = 4ax$ subtends a right angle at the vertex. The locus of the points of intersection of the normals at P and Q is the parabola

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

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

C. $y^2 = 8a(x - 4a)$

D. none

Answer: B

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41. The locus of point of intersection of two normals drawn to the parabola $y^2 = 4ax$ are perpendicular to each other is

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

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

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

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

Answer: C

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42. $P, Q,$ and R are the feet of the normals drawn to a parabola $(y - 3)^2 = 8(x - 2)$. A circle cuts the above parabola at points $P, Q, R, andS$. Then this circle always passes through the point. $(2, 3)$ (b) $(3, 2)$ (c) $(0, 3)$ (d) $(2, 0)$

A. (2,3)

B. (3,2)

C. (0,3)

D. (2,0)

Answer: A

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43. If two different tangents of $y^2 = 4x$ are the normals to the parabola $x^2 = 4ay$ then :

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

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

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

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

Answer: B

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44. For $y^2 = 4x$, pormals at P, Q, Rare concurrent at a point (3,0), then for ΔPQR

Column I	Column II
(a) Centroid	(p) 5/2
(b) Circumcentre	(q) 2
(c) Radius of circle circumscribing ΔPQR	(r) (2/3, 0)
(d) Area of ΔPQR	(s) (5/2, 0)

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Problem Set 3 True And False

1. The chord of the parabola $y^2 = 4ax$ whose equation is $y - x\sqrt{2} + 4a\sqrt{2} = 0$ is a normal to it and its length is $6\sqrt{3}a$.

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2. Whatever be the value of the line $y = (x - 11)\cos\theta - \cos 3\theta$ is a normal to the parabola $y^2 = 16x$.

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3. The tangent at one extremity of a focal chord of the parabola $y^2 = 4ax$ is parallel to the normal drawn at the other extremity.

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4. The line $x + y = 3$ is normal to the parabola $y^2 = 4x$ and the length of the chord cut off by the line from the parabola is $8\sqrt{2}$.

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Problem Set 3 Fill In The Blanks

1. The equations of tangent and normal to the parabola $y^2 = 6x$ at the point whose ordinate is 6 are .....

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2. The equations of the normal and tangent to the parabola $y^2 = 4ax$, at the extremities of the latus rectum is .....

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3. The locus of the poles of the normal chords of the parabola $y^2 = 4ax$ is .....

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4. If the perpendicular drawn from P on the polar of P with respect to the parabola $y^2 = 4ax$ touches the parabola $x^2 = 4by$ the locus of P is the

straight line

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5. If the normal at P $'t_1'$ on $y^2 = 4ax$ meets the curve again at Q, the point R on the curve, the normal at which also passes through Q has co-ordinates (..... , ...).

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Self Assessment Test

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

A. (2,0)

B. (0,2)

C. (1,0)

D. $(0, 1)$

Answer: C

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2. Consider two curves

$C_1 : y^2 = 4x, C_z : x^2 + y^2 - 6x + 1 = 0$ then

A. C_1 and C_2 touch each other only at one point

B. C_1 and C_2 touch each other exactly at two points

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

D. C_1 and C_2 neither intersect nor touch each other

Answer: B

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3. If two tangents drawn from a point P on the parabola $y^2 = 4x$ are at right angles, then the locus of P is

A. $2x - 1 = 0$

B. $x = 1$

C. $2x + 1 = 0$

D. $x = -1$

Answer: D

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4. If P and Q are the points of intersection of the circles

$x + y^2 + 3x + 7y + 2p - 5 = 0,$

$x^2 + y^2 + 2x + 2y - p^2 = 0,$

then there is a circle passing through P, Q and(1, 1) for

A. all except one value of p

B. all except two values of p

C. exactly one value of p

D. all values of p

Answer: A

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5. The shortest distance between the lines $y - x = 1$ and the curve $x = y^2$ is

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

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

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

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

Answer: D

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6. Three distinct points A, B and C are given in the 2â€“dimensional coordinate plane such that the ratio of the distance of any one of them from the point (1, 0) to the distance from the point (â€“1, 0) is equal to $\frac{1}{3}$ .Then the circumcentre of the triangle ABC is at the point :

A. $\left(\frac{5}{4}, 0\right)$

B. $\left(\frac{5}{2}, 0\right)$

C. $\left(\frac{5}{3}, 0\right)$

D. $(0, 0)$

Answer: A

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

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

B. directrix is x = 0

C. latus rectum is $\frac{2a}{3}$

D. focus is (a,0)

Answer: A::D

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8. Let A and B be two distinct points on the parabola $y^2 = 4x$. If the axis of the parabola touches a circle of radius r having AB as its diameter, then the slope of the line joining A and B can be

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

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

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

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

Answer: C::D

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9. 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) to (x, y) in the ratio 1:3. Then locus of P is

A. $x^2 = y$

B. $y^2 = 2x$

C. $y^2 = x$

D. $x^2 = 2y$

Answer: C

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10. 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. 5

C. 6

D. 8

Answer: A

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Miscellaneous Exercise Matching Entries

1. Match the entries of List-A and List-B.

	List-A		List-B
(a)	Focus of parabola $x^2 - 4x - 8y - 4 = 0$ is ...	1.	G.P.
(b)	Directrix of parabola $y^2 + 4y + 4x + 2 = 0$ is ...	2.	$(32, 32)$
(c)	Tangent at points P and Q on the parabola $y^2 = 4ax$ meet at T then SP, ST, SQ are in which series where S is focus ?	3.	$x = 3/2$
(d)	PQ is a focal chord of the parabola $y^2 = 32x$ and if P be $(2, -8)$, then the point Q is ...	4.	$(2, 1)$
(e)	PQ is a normal chord of the parabola $y^2 = 4ax$ which subtends a right angle at the vertex. PQ is inclined to axis of x at an angle ...	5.	$y^2 = 2a(x - 4a)$
(f)	The locus of mid-point of the chords of the parabola which subtend a right angle at the vertex is ...	6.	$\tan^{-1}\sqrt{2}$

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2. Let P $\left(at_1^2, 2at\right)$, $Q\left(at_2^2, 2at_2\right)$ be two points on the parabola $y^2 = 4ax$, then match the relations between t_1 and t_2 under the following conditions :

	List-A		List-B
(a)	PQ is a focal chord	1.	$t_2 = -t_1 - \frac{2}{t_1}$
(b)	PQ subtends a right angle at the vertex	2.	$t_1 t_2 = -1$
(c)	If the normal at P meets the curve again at Q	3.	$t_1 t_2 = -4$
(d)	Normals at P and Q intersect on the parabola	4.	$t_1 t_2 = 2$

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Miscellaneous Exercise Assertion Reason

1. STATEMENT-1: The curve $y = \frac{-x^2}{2} + x + 1$ is symmetric with respect to the line x =1. because

STATEMENT-2 : A parabola is symmetric about its axis.

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