



## MATHS

### BOOKS - SAI MATHS (TELUGU ENGLISH)

### PARABOLA, ELLIPSE AND HYPERBOLA

#### Problems

1. If P is a point on the parabola  $y^2 = 8x$  and A is the point (1,0) then the locus of the mid point of the line segment AP is

$$A. y^2 = 4\left(x - \frac{1}{2}\right)$$

B.  $y^2 = 2(2x + 1)$

C.  $y^2 = x - \frac{1}{2}$

D.  $y^2 = 2x + 1$

**Answer: A**



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2. The equation of the parabola with focus (1,-1) and directrix  $x+y+3=0$  is

A.  $x^2 + y^2 - 10x - 2y - 2xy - 5 = 0$

B.  $x^2 + y^2 + 10x - 2y - 2xy - 5 = 0$

C.  $x^2 + y^2 + 10x + 2y - 2xy - 5 = 0$

$$D. x^2 + y^2 + 10x + 2y + 2xy - 5 = 0$$

**Answer: A**



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3. The centre of the ellipse

$$\frac{(x + y - 3)^2}{9} + \frac{(x - y + 1)^2}{16} = 1 \text{ is}$$

A. (-1,2)

B. (1,-2)

C. (-1,-2)

D. (1,2)

Answer: D



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4. For the ellipse  $\frac{x^2}{25} + \frac{y^2}{16} = 1$  a list of lines given in List I are to be matched with their equations given in List II.

The correct match is:

- A.  $i \quad ii \quad iii$   
 $a \quad b \quad a \quad e$
- B.  $i \quad ii \quad iii$   
 $b \quad f \quad a \quad c$
- C.  $i \quad ii \quad iii$   
 $c \quad b \quad d \quad c$
- D.  $i \quad ii \quad iii$   
 $d \quad f \quad a \quad e$

**Answer: B**



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5. The product of lengths of perpendicular from any point on the hyperbola  $x^2 - y^2 = 16$  to its asymptotes, is

A. 2

B. 4

C. 8

D. 16

**Answer: C**



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6. An equilateral triangle is inscribed in the parabola  $y^2 = 8x$ , with one of its vertices is the vertex of the parabola, Then, the length of the side of that triangle is

A.  $24\sqrt{3}$

B.  $16\sqrt{3}$

C.  $8\sqrt{3}$

D.  $4\sqrt{3}$

**Answer: B**



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7. The point  $(3,4)$  is the focus and  $2x-3y+5=0$  is the directrix of a parabola . Its latusrectum is

A.  $\frac{2}{\sqrt{13}}$

B.  $\frac{4}{\sqrt{13}}$

C.  $\frac{1}{\sqrt{13}}$

D.  $3\sqrt{13}$

**Answer: A**

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8. The radius of the circle passing through the foci of the ellipse  $\frac{x^2}{16} + \frac{y^2}{9} = 1$  and having its center at (0,3) is

A. 6

B. 4

C. 3

D. 2

**Answer: B**



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9. The values that can take so that straight line  $y=4x+n$  touches the curve  $x^2 + 4y^2 = 4$  is

A.  $\pm 45$

B.  $\pm \sqrt{60}$

C.  $\pm \sqrt{65}$

D.  $\pm \sqrt{72}$

**Answer: C**



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10. The foci of the ellipse  $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$  and the hyperbola  $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$  coincide. Then, the value of  $b^2$  is

A. 5

B. 7

C. 9

D. 1

**Answer: B**



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11. If a normal chord at a point  $t$  on the parabola  $y^2 = 4ax$  subtends a right angle at the vertex, then  $t$  equals to

A. 1

B.  $\sqrt{2}$

C. 2

D.  $\sqrt{3}$

**Answer: B**



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12. The slopes of the focal chords of the parabola  $y^2 = 32x$ , which are tangents to the circle  $x^2 + y^2 = 4$  are

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

B.  $\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}$

C.  $\frac{1}{\sqrt{15}}, \frac{-1}{\sqrt{15}}$

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

**Answer: C**



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13. If tangents are drawn from any point on the circle

$x^2 + y^2 = 25$  to the ellipse  $\frac{x^2}{16} + \frac{y^2}{9} = 1$ , then the

angle between the tangents is,

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

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

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

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

**Answer: D**



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14. An ellipse passing through  $(4\sqrt{2}, 2\sqrt{6})$  has foci at  $(-4,0)$  and  $(4,0)$ . Then, its eccentricity is

A.  $\sqrt{2}$

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

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

D.  $\frac{1}{\sqrt{3}}$

**Answer: B**



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15. A hyperbola passing through a focus of the ellipse  $\frac{x^2}{169} + \frac{y^2}{25} = 1$ . Its transverse and conjugate axes coincide respectively with the major and minor axes of the ellipse. The product of eccentricities is 1. Then, the equation of the hyperbola is,

A.  $\frac{x^2}{144} - \frac{y^2}{9} = 1$

B.  $\frac{x^2}{169} - \frac{y^2}{25} = 1$

C.  $\frac{x^2}{144} - \frac{y^2}{25} = 1$

D.  $\frac{x^2}{25} - \frac{y^2}{9} = 1$

**Answer: C**



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16. A circle of radius 4, drawn on a chord of the parabola  $y^2 = 8x$  as diameter, touches the axis of the parabola. Then, the slope of the chord is

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

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

C. 1

D. 2

**Answer: C**



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17. The mid point of a chord of the ellipse  $x^2 + 4y^2 - 2x + 20y = 0$  is  $(2,-4)$ . The equation of the chord is

A.  $x-6y=26$

B.  $x+6y=26$

C.  $6x-y=26$

D.  $6x+y=26$

**Answer: A**



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18. If the foci of the ellipse  $\frac{x^2}{25} + \frac{y^2}{16} = 1$  and the hyperbola  $\frac{x^2}{4} - \frac{y^2}{b^2} = 1$  coincide, then  $b^2$  is equal to

A. 4

B. 5

C. 8

D. 9

**Answer: B**



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19. If  $x=9$  is a chord of contact of the hyperbola  $x^2 - y^2 = 9$ , then the equation of the tangent at one of the points of contact is

A.  $x + \sqrt{3}y + 2 = 0$

B.  $3x - 2\sqrt{2}y - 3 = 0$

C.  $3x - \sqrt{2}y + 6 = 0$

D.  $x - \sqrt{3}y + 2 = 0$

**Answer: B**



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20. Let  $x+y=k$  be a normal to the parabola  $y^2 = 12x$ . If  $p$  is length of the perpendicular from the focus of the parabola onto this normal, then  $4k - 2p^2$  is equal to

A. 1

B. 0

C. -1

D. 2

**Answer: B**



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21. If the line  $2x+5y=12$  intersect the ellipse  $4x^2 + 5y^2 = 20$  in two distinct point A and B, then mid-point of AB is,

A. (0,1)

B. (1,2)

C. (1,0)

D. (2,1)

**Answer: B**



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22. Equation of one of the tangent passing through (2,8) to the hyperbola  $5x^2 - y^2 = 5$  is

A.  $3x+y-14=0$

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

C.  $x+y+3=0$

D.  $x-y+6=0$

**Answer: B**



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23. The area (in sq. units) of the equilateral triangle formed by the tangent at  $(\sqrt{3}, 0)$  to the hyperbola  $x^2 - 3y^2 = 3$  with the pair of asymptotes of the hyperbola is

A.  $\sqrt{2}$

B.  $\sqrt{3}$

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

D.  $2\sqrt{3}$

**Answer: B**



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24. If a chord of the parabola  $y^2 = 4x$  passes through its focus and makes an angle  $\theta$  with the X-axis, then its length is

A.  $4 \cos^2 \theta$

B.  $4 \sin^2 \theta$

C.  $4 \operatorname{cosec}^2 \theta$

D.  $4 \sec^2 \theta$

**Answer: C**



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25. If the straight line  $y=mx+c$  is parallel to the axis of the parabola  $y^2 = lx$  and intersects the parabola at  $(\frac{c^2}{8l}, \frac{c}{2})$ , then the length of the latusrectum is

A. 2

B. 3

C. 4

D. 8

**Answer: D**



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26. The eccentricity of the ellipse

$$x^2 + 4y^2 + 2x + 16y + 13 = 0 \text{ is}$$

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

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

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

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

**Answer: A**



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27. The angle between the asymptotes of the hyperbola  $x^2 - 3y^2 = 3$  is

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

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

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

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

**Answer: C**



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**28.** Let  $M$  be the foot of the perpendicular from a point  $P$  on the parabola  $y^2 = 8(x - 3)$  onto its directrix and let  $S$  be the focus of the parabola. If  $\triangle SPM$  is an equilateral triangle, then  $P$  is equal to

A.  $(4\sqrt{3}, 8)$

B.  $(8, 4\sqrt{3})$

C.  $(9, 4\sqrt{3})$

D.  $(4\sqrt{3}, 9)$

**Answer: C**



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29. If the lines  $2x+3y+12=0$ ,  $x-y+k=0$  are conjugate with respect to the parabola  $y^2 = 8$  then  $k$  is equal to

A. 10

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

C.  $-12$

D.  $-2$

**Answer: C**



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30. Find the equation to the parabola, whose axis is parallel to the  $y$ -axis and which passes through the

points (0,4), (1,9) and (4,5) is

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

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

C.  $y = \frac{-19}{2}x^2 + \frac{79}{12}x + 4$

D.  $y = \frac{-19}{12}x^2 + \frac{89}{12} + 1$

**Answer: C**



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**31.** The equation of the hyperbola which passes through the point (2,3) and has the asymptotes  $4x+3y-7=0$  and  $x-2y-1=0$  is

A.  $4x^2 + 5xy - 6y^2 - 11x + 11y + 50 = 0$

B.  $4x^2 + 5xy - 6y^2 - 11x + 11y - 43 = 0$

C.  $4x^2 - 5xy - 6y^2 - 11x + 11y + 57 = 0$

D.  $x^2 - 5xy - y^2 - 11x + 11y - 43 = 0$

**Answer: C**



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**32.** The product of the perpendicular distances from any point of the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  to its asymptotes is

A.  $\frac{a^2b^2}{a^2 - b^2}$

B.  $\frac{a^2b^2}{a^2 + b^2}$

C.  $\frac{a^2 + b^2}{a^2b^2}$

D.  $\frac{a^2 - b^2}{a^2b^2}$

**Answer: B**



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**33.** The number of normals drawn to the parabola

$y^2 = 4x$  from the point (1,0) is

A. 0

B. 1

C. 2



D. 3

**Answer: B**



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**34.** If the distance between the foci of an ellipse is 6 and the length of the minor axis is 8, then the eccentricity is

A.  $\frac{1}{\sqrt{5}}$

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

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

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

**Answer: C**



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**35.** The eccentricity of the conic

$$\frac{5}{r} = 2 + 3 \cos \theta + 4 \sin \theta \text{ is}$$

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

B. 1

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

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

**Answer: D**



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36. If the circle  $x^2 + y^2 = a^2$  intersects the hyperbola

$xy = c^2$  in four points

$(x_i, y_i)$  for  $i = 1, 2, 3$  and  $4$  then  $y_1 + y_2 + y_3 + y_4$

equals

A. 0

B.  $c$

C.  $a$

D.  $c^4$

**Answer: A**



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37. The mid point of the chord  $4x-3y=5$  of the hyperbola  $2x^2 - 3y^2 = 12$  is

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

B. (2,1)

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

D.  $\left(\frac{11}{4}, 2\right)$

**Answer: B**



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38. If  $2x+3y+12=0$  and  $x - y + 4\lambda = 0$  are conjugate lines with respect to the parabola  $y^2 = 8x$ , then  $\lambda$  is equal to

A. 2

B.  $-2$

C. 3

D.  $-3$

**Answer: D**



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39. For an ellipse with eccentricity  $\frac{1}{2}$  the centre is at the origin, if one directrix is  $x=4$ , then the equation of the ellipse is

A.  $3x^2 + 4y^2 = 1$

B.  $3x^2 + 4y^2 = 12$

C.  $4x^2 + 34y^2 = 1$

D.  $4x^2 + 3y^2 = 12$

**Answer: B**



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40. The distance between the foci of the hyperbola

$$x^2 - 3y^2 - 4x - 6y - 11 = 0 \text{ is}$$

A. 4

B. 6

C. 8

D. 10

**Answer: C**



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41. For the parabola  $y^2 + 6y - 2x + 5 = 0$

Statement I The vertex is  $(-2,-3)$

Statement II The directrix is  $y+3=0$

Which of the following is correct?

A. Both I and II are true

B. I is true, II is false

C. I is false, II is true

D. Both I and II are false

**Answer: B**



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42. The value of  $k$ , if  $(1,2)$   $(k,-1)$  are conjugate point with respect to the ellipse  $2x^2 + 3y^2 = 6$  is

A. 2

B. 4

C. 6

D. 8

**Answer: C**



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43. If the line  $lx+my=1$  is a normal to the hyperbola

$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  then  $\frac{a^2}{l^2} - \frac{b^2}{m^2}$  is equal to

A.  $a^2 - b^2$

B.  $a^2 + b^2$

C.  $(a^2 + b^2)^2$

D.  $(a^2 - b^2)^2$

**Answer: C**



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**44.** Let O be the origin and A be a point on the curve

$y^2 = 4x$ . Then the locus of the mid point of OA is

A.  $x^2 = 4y$

B.  $x^2 = 2y$

C.  $y^2 = 16x$

D.  $y^2 = 2x$

**Answer: D**



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**45.** 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 semilatusrectum is

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

B.  $\sqrt{bc}$

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

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

**Answer: D**



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**46.** Equation of the latusrectum of the ellipse

$$9x^2 + 4y^2 - 18x - 8y - 23 = 0 \text{ are}$$

A.  $y = \pm \sqrt{5}$

B.  $x = \pm \sqrt{5}$

C.  $y = 1 \pm \sqrt{5}$

D.  $x = -1 \pm \sqrt{5}$

Answer: C



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47. If the eccentricity of a hyperbola is  $\sqrt{3}$  then the eccentricity of its conjugate hyperbola is

A.  $\sqrt{2}$

B.  $\sqrt{3}$

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

D.  $2\sqrt{3}$

Answer: C



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48. If a point P moves such that its distances from the point A(1,1) and the line  $x+y+2=0$  are equal, then the locus of P is

- A. a straight line
- B. a pair of straight line
- C. a parabola
- D. an ellipse

**Answer: C**



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49. The parabola with directrix  $x+2y-1=0$  and focus  $(1,0)$  is

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

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

C.  $4x^2 + 5xy + y^2 - 8x + 4y + 4 = 0$

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

**Answer: A**



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50. The lines among the following which touches the parabola  $y^2 = 4ax$ , is

A.  $x + my + am^3 = 0$

B.  $x - my + am^2 = 0$

C.  $x + my - am^2 = 0$

D.  $x + my + am^2 = 0$

**Answer: B**



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51. The eccentricity of the conic

$$36x^2 + 144y^2 - 36x - 96y - 119 = 0 \text{ is}$$

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

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



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

D.  $\frac{1}{\sqrt{3}}$

**Answer: A**



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**52.** The eccentricity of the ellipse

$$9x^2 + 5y^2 - 18x - 20y - 16 = 0 \text{ is}$$

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

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

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

D. 2

**Answer: B**



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**53.** The product of the lengths of perpendiculars drawn from any point on the hyperbola  $x^2 - 2y^2 - 2 = 0$  to its asymptotes is

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

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

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

D. 2

**Answer: B**



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54. The equations of the parabola with focus  $(0,0)$  and directrix  $x+y=4$ , is

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

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

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

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

**Answer: A**



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

A.  $y^2 = 3x$

B.  $y^2 = 6x$

C.  $y^2 = 12x$

D.  $y^2 = 2x$

**Answer: C**



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56. If  $e$  and  $e'$  are the eccentricities of the ellipse  $5x^2 + 9y^2 = 45$  and the hyperbola  $5x^2 - 4y^2 = 45$

respectively, then ee' is equal to

A. 1

B. 4

C. 5

D. 9

**Answer: A**



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57. The pole of the straight line  $x+4y=4$  with respect to the ellipse  $x^2 + 4y^2 = 4$  is

A. (1,1)

B. (1,4)

C. (4,1)

D. (4,4)

**Answer: A**



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**58.** Locus of the poles of focal chord of a parabola is

A. the axis

B. a focal chord

C. the directrix

D. the tangent at the vertex

**Answer: C**



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59. The equation  $\frac{1}{r} = \frac{1}{8} + \frac{3}{8} \cos \theta$  represents

A. a parabola

B. an ellipse

C. a hyperbola

D. a rectangular hyperbola

**Answer: C**



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60. The lengths of latusrectum of parabola  $y^2 + 8x - 2y + 17 = 0$  is

A. 2

B. 4

C. 8

D. 16

**Answer: C**



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

A.  $(-6,9)$

B.  $(9,-6)$

C.  $(-9,-6)$

D.  $(-6,-9)$

**Answer: B**



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62. The eccentricity of ellipse  $\frac{x^2}{16} + \frac{y^2}{9} = 1$  is

A.  $\frac{7}{16}$

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

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

D.  $\frac{\sqrt{7}}{2}$

**Answer: C**



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63. The products of lengths of perpendiculars from any point of hyperbola  $x^2 - y^2 = 8$  to its asymptotes,

is

A. 2

B. 3

C. 4

D. 8

**Answer: C**



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**64.**

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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**65.** Equation of curve in polar coordinates is

$$\frac{l}{r} = 2 \sin^2 \frac{\theta}{2} \text{ then it represents}$$

A. a straight line

B. a parabola

C. a circle

D. an ellipse

**Answer: B**



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