MATHS

JEE (MAIN AND ADVANCED MATHEMATICS) FOR BOARD AND COMPETITIVE EXAMS

CONIC SECTIONS

Example

1. Find the equation of the circle whose centre is $(2, -2)$ and radius is 8.

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2. Find the centre and radius of the circle $x^2 + y^2 + 6x - 10y - 2 = 0$

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3. Find the equation of the circle passes through the points $(2, 1)$ and $(-2, 3)$ and has centre on the line $x + y + 4 = 0$

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4. Find the radius and centre of the circle passing through the points $(2, 0)$, $(6, 0)$ and $(4, 2)$.

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5. Find the centre and radius of the circle $x^2 + y^2 - 6x + 4y - 12 = 0.$

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6. Find the equation of the circle which passes through the origin and cuts off intercepts $3 and 4$ from the positive parts of the axes respectively.

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7. Find the equation of the circle which lies in the first quadrant and touching each-co ordinate-axis at a distance of 2 units from the origin.

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8. Find the co-ordinates of the focus, the equation of the directrix and latus rectum of the parabola $y^2 = 20x$.

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

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10. Find the equation of the parabola with vertex at (0, 0) and focus at (0, 5).

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11. Find the equation of the parabola which is symmetric about the x-axis and passes through the point $(-2, -3)$

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12. Find the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = -8y$ to the ends of its latus rectum.

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13. Given the ellipse with equation $x^2 + 4y^2 = 16$, find the length of major and minor axes, eccentricity, foci and vertices.

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14. Find the equation of ellipse whose vetices are $(5, 0)$ and foci are $(\pm 4, 0)$

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15. Find the equation of the ellipse, the co-ordinates of whose foci are $(0, \pm 4)$ and eccentricity $\frac{4}{5}$

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16. If the length of the latus rectum of an ellipse with major axis along x-axis and centre at origin is 20 units, distance between foci is equal to length of minor axis, then find the equation of the ellipse.

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17. If the eccentricity of an ellipse is $\frac{4}{9}$ and the distance between its foci is 8 units, then find the length of the latus rectum of the ellipse.

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18. If $\frac{x^2}{36} - \frac{y^2}{64} = 1$ represents a hyperbola, then find the co-ordinates of the foci and the vertices, the eccentricity and the length of the latus rectum.

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19. Find the equation of the hyperbola whose foci are $(\pm 5, 0)$ and vertices are $(\pm 3, 0)$.

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20. Find the equation of the hyperbola with foci $(0, \pm 10)$ and 30 as the length of latus rectum.

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21. If the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ passes through the points $(3\sqrt{2}, 2)$ and $(6, 2\sqrt{3})$, then find the value of e i.e., eccentricity of the given hyperbola.

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22. Prove that the points $A(4, 0), B(6, 1), C(4, 3)$ and D(3, 2) are concyclic.

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23. about to only mathematics

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24. Find the equation of the circle with centre on the line 2x + y = 0 and touching the line $4x - 3y + 10 - 0, 4x - 3y = 30$.

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25. Find the equation of the circle passing through the origin and through the points of contact of tangents from the origin to the circle.

$x^2 + y^2 - 11x + 13y + 17 = 0$

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26. Find the equation of circle passing through the origin and cutting the circles

$x^2 + y^2 - 4x + 6y + 10 = 0$ and $x^2 + y^2 + 12y + 6 = 0$

orthogonally.

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27. Prove that the circle

$x^2 + y^2 + 2ax + c^2 = 0$ and $x^2 + y^2 + 2by + c^2 = 0$

touch each other if

$$\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}.$$

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28. Find the equation of the circle whose diameter is the common chord of the circles

$x^2 + y^2 + 2x + 3y + 1 = 0$ and $x^2 + y^2 + 4x + 3y + 2 = 0$

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29. Show that the line $3x - 4y - c = 0$ will meet the circle having centre at (2, 4) and the radius 5 in real and distinct points if $-35 < c < 15$.

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30. Tangents are drawn to the circle $x^2 + y^2 = 12$ at the points where it is met by the circle

$x^2 + y^2 - 5x + 3y - 2 = 0$. Find the point of intersection of these tangents.

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31. Find the equation (s) of the common tangent(s) to the parabola $y^2 - 4x - 2y + 5 = 0$ and $y^2 = -4x$.

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32. Prove that the semi-latusrectum of the parabola $y^2 = 4ax$ is the harmonic mean between the segments of any focal chord of the parabola.

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33. Find the area of the quadrilateral formed by common tangents drawn from a point P to the circle $x^2 + y^2 = 8$ and the parabola $y^2 = 16x$, chord of contact of tangents to the circle and chord of contact of tangents to the parabolas.

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34. Find the vertex, focus , and directrix axis of the parabola $x^2 + 4y + 3x = 2$. Sketch the curve.

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35. Find the equation of the straight lines touching both $x^2 + y^2 = 2a^2$ and $y^2 = 8ax$.

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36. Find the locus of the middle points of the chords of the parabola $y^2 = 4x$ which touch the parabola $x^2 = -8y$.

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37. Find the equation of the ellipse whose foci are $(2, 3), (-2, 3)$ and whose semi-minor axes is $\sqrt{5}$.

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38. If the normals at an end of a latus rectum of an ellipse passes through the other end of the minor axis, then prove that $e^4 + e^2 = 1$.

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39. Show that $3x^2 - 3y^2 - 18x + 12y + 2 = 0$ represents a rectangular hyperbola. Find its centre foci and eccentricity.

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40. If the normal at four points $P_i(x_i, (y_i)l, I = 1, 2, 3, 4$ on the rectangular hyperbola $xy = c^2$ meet at the point

$Q(h, k)$, prove that

$$x_1 + x_2 + x_3 + x_4 = h, y_1 + y_2 + y_3 + y_4 = k$$

$$x_1 x_2 x_3 x_4 = y_1 y_2 y_3 y_4 = -c^4$$

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41. Find the equation of a hyperbola whose asymptotes are $2x - y - 3 = 0$ and $3x + y - 7 = 0$ and which pass through $(1, 1)$.

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Try ypurself

1. Find the equation of the circle with centre at (0, 0) and radius 4.

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2. Find the equation of the circle with centre at $\left(\frac{1}{2}, \frac{1}{4}\right)$ and radius $\frac{1}{4}$.

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3. Find the centre and radius of the circle $4x^2 + 4y^2 + 16y - 4x = 19$.

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4. Find the centre and radius of the circle $x^2 + y^2 + 10x - 12y + 9 = 0$

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5. Find the equation of the circle which passes through (3,-2), (-2,0) and has its centre on the line $2x - y = 3$.

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6. Find the equation of the circle which passes through the points $(7, 0)$, (0, sqrt(7))` and has its centre on the x-axis.

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7. Find the length of the diameter of the cirlce which passes through the points $(-3, 6), (-5, 2)$ and $(3, -6)$.

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8. Find the equation of the circle which passes through the points $(2, 8), (5, 7)$ and $(6, 6)$.

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9. Find the center and radius of the circle given by the equation $2x^2 + 2y^2 + 3x + 4y + \frac{9}{8} = 0$.

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10. Find the centre and radius of the circle $ax^2 + ay^2 + 2gx + 2fy + c = 0$ where $a \neq 0$.

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11. Find the equation of the circle, passing through the origin and cutting off intercepts 2a units and b units on the x-axis and y-axis respectively.

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12. Find the equation of the circle, passing through (0, 0) and cutting off intercepts 2 units and 5 units from the positive direction of x-axis and y-axis respectively.

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13. If the circle is touching the co-ordinates axes and having centre at $(-3, 3)$, then find its equation.

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14. Find the equation of circle of radius 3, passing through the origin and having its centre on the x-axis.

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15. Find the length of the latus rectum of the parabola $x^2 = -8y$.

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16. If $y^2 = -12x$ is the given equation of the parabola, then find the equation of the directrix.

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17. Find the equation of the parabola with focus $(-3, 0)$ and the equation of the directrix is x = 3.

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18. Find the equation of the parabola with focus (7, 0) and equation of the directrix is x = -7.

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19. Find the equation of the parabola with vertex at origin and focus at $(-3, 0)$.

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20. Find the equation of the parabola with vertex at origin and focus at $(0, -7)$.

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21. Find the equation of the parabola which is symmetric about the y-axis and passes through the point $(2, -4)$.

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22. Find the equation of the parabola which is symmetric about the x-axis and passes through the point $(2, -6)$.

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23. Find the area of the triangle formed by the lines joining the vertex of the parabola $y^2 = 16x$ to the ends of the latus rectum.

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24. Find the area of the triangle formed by the lines joining the focus of the parabola $y^2 = 4x$ to the points on it which have abscissa equal to 16.

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25. The given equation of the ellipse is $\frac{x^2}{81} + \frac{y^2}{16} = 1.$ Find the length of the major and minor axes. Eccentricity and length of the latus rectum.

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26. Find the co-ordinates of the foci, the vertices, the lengths of major and minor axes and the eccentricity of the ellipse $16x^2 + 49y^2 = 784$.

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27. Find the equation of the ellipse whose vetices are $(\pm 6, 0)$ and foci are $(\pm 4, 0)$.

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28. Find the equation of the ellipse whose vertices are $(\pm 13, 0)$and foci are $(\pm 5, 0)$.

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29. Find the equation of th ellipse, the co-ordinates of whose foci are $(\pm 3, 0)$ and eccentricity is $\frac{1}{2}$.

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30. Find the equation of an ellipse whose eccentricity is $\frac{3}{5}$ and co-ordinates of foci are $(0, \pm 6)$.

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31. If the length of the latus rectum of an ellipse with major axis along y-axis and centre at origin is 6 units, distance between foci is equal to length of minor axis, then the equation of the ellipse.

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32. The length of the latus rectum of an ellipse with major axis along x-axis and centre at origin is 12 units, distance between th e focus and the origin is equal to length of minor axis. Find the length of the major axis and minor axis.

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33. The eccentricity of the ellipse is $\frac{2}{5}$ and the distance between the foci is 10. Find the length of the latus rectum of the ellipse.

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34. Find the length of the latus rectum of the ellipse if the eccentricity is $\frac{1}{2}$ and the distance between the foci and the centre of the ellipseis 4.

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35. Find the co-ordinates of the foci and the vertices, the eccentricity and the length of the latus rectum of the hyperbola $y^2 - 25x^2 = 25$.

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36. For the hyperbola, $3y^2 - x^2 = 3$. Find the co-ordinates of the foci and vertices, eccentricity and length of the latus rectum.

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37. If the co-ordinates of the foci and vertices of the hyperbola are $(\pm 13, 0)$ and $(\pm 5, 0)$ respectively, then find the equation of the hyperbola.

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38. Find the equation of the hyperbola with foci : $(0, \pm\sqrt{13})$ and vertices : $(0, \pm 2)$.

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39. Find the equation of the hyperbola with foci at $(\pm 7, 0)$ and length of the latus rectum as 9.6 units.

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40. Find the equation of the hyperbola, the length of whose focal chord, perpendicular to the transverse axis, is 8 units and the co-ordinates of the foci are $\left(0, \ \pm 3\sqrt{5}\right)$.

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41. Find the eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ which passes through the points (3, 0) and $\left(2\sqrt{3}, \frac{4}{\sqrt{3}}\right)$

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42. The hyperbola $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$ passes through the points $(0, \ -2)$ and $(\sqrt{3}. \ 4)$. Find the value of e i.e., the eccentricity of the given hyperbola.

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Assignment (SECTION - A)

1. The equation of the circle with centre at $(1, 3)$ and radius 3 is

A. $(x-1)^2 + (y-3)^2 = 9$

B. $(x+1)^2 + (y+3)^2 = (3)^2$

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

D. $(x+3)^2 + (y+1)^2 = (3)^2$

Answer: A

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2. The centre and radius of the circle $(x+2)^2 + (y+4)^2 = 9$ are

A. (2, 4) and 3

B. $(-2, -4)$ and 3

C. $(-2, -4)$ and 9

D. $(2, -4)$ and 3

Answer: B

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3. The radius of the circle $x^2 + y^2 + 4x - 6y + 12 = 0$ is

A. 5

B. $\sqrt{13}$

C. 1

D. $\sqrt{17}$

Answer: C

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4. If the perpendicular distance of the line $lx + my = 1$ from the point (0, 0) is a, then the diameter of the circle touching the given line and with centre (0, 0) is

A. 2a units

B. a units

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

D. 3a units

Answer: A

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5. The equation of a circle of radius 4 units, touching the x-axis at (5, 0) and lying in fourth quadrant, is

A. $x^2 + y^2 + 10x - 8y - 25 = 0$

B. $x^2 + y^2 - 10x + 8y + 25 = 0$

C. $x^2 + y^2 + 5x - 4y - 20 = 0$

D. $x^2 + y^2 - 5x + 4y + 20 = 0$

Answer: B

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6. The equation of the circle in the third quadrant touching each co-ordinate axis at a distance of 2 units from the origin is

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

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

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

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

Answer: B

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7. The equation of the circle with radius 3 units, passing through the point (2, 1) and whose centre lies on the line y + x = 0 can be

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

B. $(x-1)^2+(y-1)^2=(3)^2$

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

D. $(x+1)^2+(y-1)^2=(3)^2$

Answer: D

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8. The equation of the circle with radius $\sqrt{5}$ units whose centre lies. On y-axis and passes through the point (2, 3) can be

A. $x^2 + (y - 4)^2 = 5$

B. $x^2 + (y + 4)^2 = 5$

C. $(x - 4)^2 + y^2 = 5$

D. $(x + 4)^2 + y^2 = 5$

Answer: A

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9. The equation of the circle passing through (0, 0) and making intercepts 2 units and 3 units on the x-axis and y-axis repectively, is

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

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

C. $x^2 + Y^2 - 2x - 6y + 1 = 0$

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

Answer: B

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10. If 'P' is any point on the circumference of the circle $x^2 + y^2 - 4x - 4y - 8 = 0$, then the perpendicular distance of the tangent at P from the centre of the circle is

A. 8 units

B. 16 units

C. 4 units

D. 2 units

Answer: C

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11. The equation of the circle having centre (0, 0) and passing through the point of intersection of the lines $4x + 3y = 2$ and $x + 2y = 3$ is

A. $x^2 + y^2 = \sqrt{5}$

B. $x^2 + y^2 = 5$

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

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

Answer: B

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12. The equation of the circle which passes through the point (3, 4) and has its centre at (2, 2) is

A. $x^2 + y^2 + 4x + 4y - 1 = 0$

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

C. $x^2 + y^2 - 4x - 4y - 1 = 0$

D. $x^2 + y^2 - 4x - 4y + 3 = 0$

Answer: D

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13. If the lines 3x + y = 11 and x - y = 1 are the diameters of a circle of area 154 sq. units, then the equation of the circle is

A. $(x-3)^2+(y-2)^2=(7)^2$

B. $(x+3)^2+(y+2)^2=(7)^2$

C. $(x-2)^2+(y-3)^2=(7)^2$

D. $(x+2)^2+(y+3)^2=(7)^2$

Answer: A

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14. The point (2, 4) lies inside the circle $x^2+y^2=16$. The above statement is

A. Always false

B. Always true

C. Can be true

D. Cannot be determined

Answer: A

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15. The equation of the parabola with focus (3, 0) and directrix y = -3 is

A. $x^2 = 12y$

B. $x^2 = -12y$

C. $y^2 = 12x$

D. $y^2 = -12x$

Answer: C

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16. The equation of the parabola with vertex at (0, 0) and focus at (0, 4) is

A. $y^2 = 16x$

B. $x^2 = 16y$

C. $x^2 = 4y$

D. $y^2 = 4x$

Answer: B

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17. The equation of the directrix of the parabola $x^2 = 8y$ is

A. $y = -2$

B. $x = -2$

C. $y = -8$

D. $x = 8$

Answer: A

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18. The co-ordinate of the focus of the parabola $y^2 = 24x$ is

A. $(0, -6)$

B. $(-6, 0)$

C. $(0, 6)$

D. $(6, 0)$

Answer: D

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19. If $x^2 = 20y$ represents a parabola, then the distance of the focus from the vertex of the parabola is

A. 3 units

B. 4 units

C. 5 units

D. 6 units

Answer: C

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20. The length of the latus rectum of the parabola $x^2 = -28y$ is

A. 28 units

B. 7 units

C. 14 units

D. 21 units

Answer: A

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21. If the parabola $y^2 = 4ax$ passes through the point (4, 1), then the distance of its focus the vertex of the parabola is

A. $\frac{1}{16}$

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

C. 16

D. 4

Answer: A

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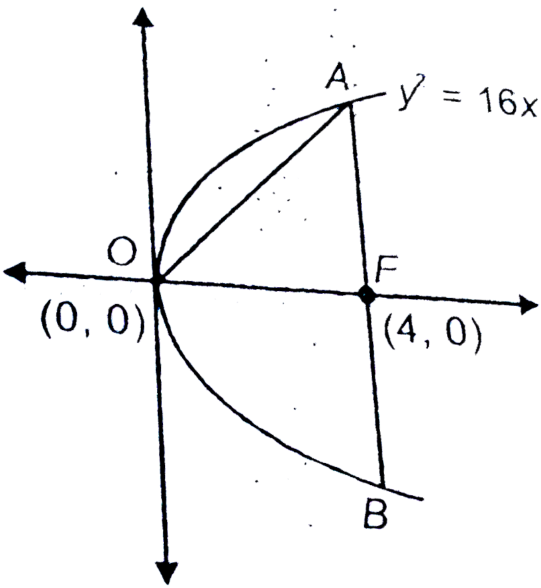
22. 

In the given figure, the area of the $\triangle OAF$ is

A. 32 sq. units

B. 4 sq. units

C. 8 sq. units

D. 16 sq. units

Answer: D

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23. Find the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 8y$ to the ends of its latus rectum.

A. (a) 8 sq. units

B. (b) 16 sq. units

C. (c) 4 sq. units

D. (d) 32 sq. units

Answer: A

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24. The focal distance of a point on the parabola $y^2 = 12\xi s4$. Find the abscissa of this point.

A. $(\pm 2\sqrt{3}, 1)$

B. $(1, \ \pm 2\sqrt{3})$

C. $(0, \ \pm 2\sqrt{3})$

D. $(\pm , 2\sqrt{3}, 0)$

Answer: B

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25. The area of the triangle formed by the lines joining the focus of the parabola $y^2 = 12x$ to the points on it which have abscissa 12 are

A. (a) 100 sq. units

B. (b) 130 sq. units

C. (c) 120 sq. units

D. (d) 108 sq. units

Answer: D

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26. The equation of the set of all points which are equidistant from the point (0, 4) and the line $y = -4$

A. $x^2 = 16y$

B. $x^2 = -16y$

C. $y^2 = 16x$

D. $y^2 = -16x$

Answer: A

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27. The length of the major axis and minor axis of $9x^2 + y^2 = 36$ respectively are

A. 4 units and 12 units

B. 12 units and 4 units

C. 2 units and 6 units

D. 6 units and 2 units

Answer: B

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28. The co-ordinates of the vertices of the ellipse $\frac{X^2}{16} + \frac{y^2}{9} = 1$ are

A. $(\pm 4, 0)$

B. $(0, \pm 4)$

C. $(\pm 3, 0)$

D. $(0, \pm 3)$

Answer: A

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29. The length of the latus rectum of $16x^2 + y^2 = 16$ is

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

B. 32

C. 8

D. 16

Answer: A

30. The relationship between, the semi-major axis, seimi-minor axis and the distance of the focus from the centre of the ellipse is

A. $a^2 = b^2 - c^2$

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

C. $b^2 = a^2 + c^2$

D. $c^2 = a^2 + b^2$

Answer: B

31. The eccentricty of an ellipse, the co-ordinates of whose vertices and foci are $(\pm 4, 0)$ and $(\pm\sqrt{7}, 0)$ respectively, is

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

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

C. $\frac{9}{2}$

D. $\frac{2}{9}$

Answer: A

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32. The equation of the ellipse whose vertices and foci are $(\pm 3, 0)$ and $(\pm\sqrt{5}, 0)$ respectively, is

A. $\frac{x^2}{2} + \frac{y^2}{3} = 1$

B. $\frac{x^2}{4} + \frac{y^2}{9} = 1$

C. $\frac{x^2}{9} + \frac{y^2}{4} = 1$

D. $\frac{x^2}{3} + \frac{y^2}{2} = 1$

Answer: C

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33. If P is a point on the ellipse $\frac{X^2}{9} + \frac{y^2}{4} = 1$ whose foci are S and S' then the value of PS + PS' is

A. 6

B. 4

C. 3

D. 2

Answer: A

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34. If e' is the eccentricity of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ $(a > b)$, then

A. $a^2 = b^2(1 - e^2)$

B. $b^2 = a^2(1 - e^2)$

C. $a^2 = b^2(e^2 - 1)$

D. $b^2 = a^2(e^2 - 1)$

Answer: B

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35. The equation of the ellipse whose length of the major axis is 10 units and co-ordinates of the foci are $(0, \pm 4)$ is

A. $\frac{x^2}{5} + \frac{y^2}{3} = 1$

B. $\frac{x^2}{3} + \frac{y^2}{5} = 1$

C. $\frac{x^2}{25} + \frac{y^2}{9} = 1$

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

Answer: D

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36. If the major axis of an ellipse is alongthe y-axis and it passes through the points $(0, \sqrt{3})$ and $(\sqrt{2}, 0)$, then the equation of the elliipse is

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

B. $3x^2 + 2y^2 = 6$

C. $2x^2 + 3y^2 = 1$

D. $2x^2 + 3y^2 = 6$

Answer: B

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37. If the latus rectum of an ellipse with major axis along y-axis and centre at origin is $\frac{1}{5}$, distance between foci = length of minor axis, then the equation of the ellipse is

A. $50y^2 + 25x^2 = 1$

B. $\frac{x^2}{50} + \frac{y^2}{25} = 1$

C. $\frac{x^2}{25} + \frac{y^2}{50} = 1$

D. $50x^2 + 25y^2 = 1$

Answer: D

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38. The eccentricity of the ellipse $x^2 + 2y^2 = 6$ is

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

B. $\sqrt{2}$

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

D. 2

Answer: A

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39. If the length of the eccentricity of an ellipse is $\frac{3}{8}$ and the distance between the foci is 6 units, then the length of the latus rectum of the ellipse is

A. (a) $\frac{55}{8}$

B. (b) $\frac{55}{4}$

C. (c) $\frac{8}{55}$

D. (d) $\frac{4}{55}$

Answer: B

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40. If the latus rectum of an ellipse is equal to half of the minor axis, then what is its eccentricity ?

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

B. $\sqrt{3}$

C. 2

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

Answer: A

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41. The equation of the set of all point the sum of whose distances from the points (2, 0) and $(-2, 0)$ is 8

A. $\frac{x^2}{16}+\frac{y^2}{12}=1$

B. $\frac{x^2}{12}+\frac{y^2}{16}=1$

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

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

Answer: A

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42. The equation of the ellipse, the co-ordinates of whose foci a re $\left(\pm\sqrt{3}, 0\right)$ and length of the semi-major axis as 2 is

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

B. $4x^2 + y^2 + 4$

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

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

Answer: D

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43. A point P is moving in a plane such that the difference of its distances from two fixed points in the same plane is a constant. The path traced by the point P is a/an

A. Circle

B. parabola

C. Ellipse

D. Hyperbola

Answer: D

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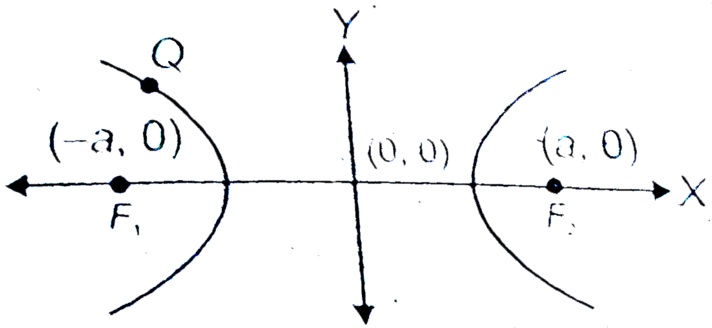
44. In the given figure, the value of $QF_2 - QF_1$ is



A. (a)2a

B. (b)2b

C. (c)a

D. (d)b

Answer: A

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45. The co-ordinates of the vertices of $x^2 - y^2 = 1$ are

A. $(\pm 5, 0)$

B. $(\pm 2, 0)$

C. $(\pm 1, 0)$

D. $(\pm 3, 0)$

Answer: C

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46. The length of the transverse axis of the hyperbola $x^2 - 20y^2 = 20$ is

A. 1

B. $2\sqrt{5}$

C. $4\sqrt{5}$

D. 2

Answer: C

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47. The length of the latus rectum of $3x^2 - 2y^2 = 6$ is

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

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

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

D. $3\sqrt{2}$

Answer: D

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48. The length of the hyperbola of the conjugate axis of $2x^2 - 3y^2 = 6$ is

A. $2\sqrt{2}$

B. $2\sqrt{3}$

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: A

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49. The eccentricity of the hyperbola $y^2 - 25x^2 = 25$ is

A. $\sqrt{26}$

B. $\dfrac{1}{\sqrt{26}}$

C. $\dfrac{\sqrt{26}}{5}$

D. $\dfrac{1}{5}$

Answer: C

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50. The co-ordinates of the foci of $16y^2 - x^2 = 16$ are

A. $\left(0, \ \pm\sqrt{17}\right)$

B. $\left(\pm\sqrt{17}, 0\right)$

C. $(0, \pm 4)$

D. $(0, \pm 1)$

Answer: A

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51. The equation of the hyperbola with foci $(0, \pm 5)$ and vertices $(0, \pm 3)$ is

A. $\frac{y^2}{16} - \frac{x^2}{9} = 1$

B. $\frac{y^2}{9} - \frac{x^2}{16} = 1$

C. $\frac{y^2}{3} - \frac{x^2}{4} = 1$

D. $\frac{y^2}{4} - \frac{x^2}{3} = 1$

Answer: B

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52. The equation of the hyperbola whose foci are $(\pm 5, 0)$ and length of the latus rectum is $\frac{9}{2}$ is

A. $\frac{x^2}{16} - \frac{y^2}{9} = 1$

B. $\frac{x^2}{9} - \frac{y^2}{16} = 1$

C. $16x^2 - 9y^2 = 1$

D. $9y^2 - 16x^2 = 1$

Answer: A

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53. The equation of the hyperbola with verticles $(0, \pm 7)$ and eccentricity $= \frac{9}{7}$ is

A. $\frac{x^2}{49} - \frac{y^2}{32} = 1$

B. $\frac{y^2}{49} - \frac{x^2}{32} = 1$

C. $\frac{x^2}{7} - \frac{y^2}{4\sqrt{2}} = 1$

D. $\frac{y^2}{7} - \frac{x^2}{4\sqrt{2}} = 1$

Answer: B

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54. The length of the transverse axis and the conjugate axis of a hyperbola is 2a units and 2b units repectively. If the length of the latus rectum is 4 units of the conjugate axis is equal to one-third of the distance between the foci, then the eccentricity of the hyperbola is

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

B. 6b

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

D. $\frac{b}{6}$

Answer: A

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55. If the distance between the foci of a hyperbola with x-axis as the major axis is 16 units and its eccentricity is $\frac{4}{3}$, then its equation is

A. $7x^2 - y^2 = 252$

B. $7x^2 - 9y^2 = 252$

C. $7x^2 - y^2 = 252$

D. $9x^2 - y^2 = 252$

Answer: B

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SECTION-B

1. Find the equation of a circle passing through the points $(5, 7), (6, 6)$ and $(2, -2)$. Find its centre and radius.

A. $2\sqrt{2}$

B. $3\sqrt{2}$

C. $2\sqrt{2}$

D. $5\sqrt{2}$

Answer: A

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2. If the lines 2x-3y=5 and 3x-4y=7 are the diameters of a circle of area 154 square units, then obtain the equation of the circle.

A. $x^2 + y^2 - 2y = 62$

B. $x^2 + y^2 + 2x - 2y = 47$

C. $x^2 + y^2 - 2x + 2y = 62$

D. $x^2 + y^2 - 2x + 2y = 47$

Answer: D

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3. The equation of the diameter of the circle $x^2 + y^2 + 2x - 4y$ that is parallel $3x + 5y = 4$ is :

A. $3x + 5y = 7$

B. $3x - 5y = 7$

C. $3x + 5y = -7$

D. $3x - 5y = -7$

Answer: A

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4. The intercept on the line y=x by the circle $x^2 + y^2 - 2x = 0$ is AB. Equation of the circle on AB as a diameter is

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

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

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

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

Answer: C

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5. The shortest distance from the point (2,-7) to thwe circe $x^2 + y^2 - 14x - 10y - 151 = 0$ is equal to 5.

A. 4

B. 3

C. 2

D. 1

Answer: C

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6. Find the length of the tangent drawn from any point on the circle $x^2 + y^2 + 2gx + 2fy + c_1 = 0$ to the circle $x^2 + y^2 + 2gx + 2fy + c_2 = 0$

A. $\sqrt{b - a}$

B. $\sqrt{a - b}$

C. $\sqrt{a + b}$

D. $\sqrt{ab}$

Answer: A

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7. If the line $y = 3x + c$ is a tangent to $x^2 + y^2 = 4$ then the value of c is

A. ± 4

B. $\pm 2\sqrt{10}$

C. $\pm 10\sqrt{2}$

D. $\pm\sqrt{10}$

Answer: B

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8. The length of intercept on the straight line $3x + 4y - 1 = 0$ by the circle $x^2 + y^2 - 6x - 6y - 7 = 0$ is

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

B. (b)6

C. (c)$4\sqrt{2}$

D. (d)$\sqrt{2}$

Answer: B

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9. Locus of middle point of intercept of any tangent with respect to the circle $x^2 + y^2 = 4$ between the axis is

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

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

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

D. $x^2 + y^2 - 3x^2y^2 = 0$

Answer: A

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10. If the circle $x^2 + y^2 + 4x + 22y + c = 0$ bisects the circumference of the circle $x^2 + y^2 - 2x + 8y - d = 0$ then c+d is equal to

A. 60

B. -46

C. 40

D. 56

Answer: B

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11. If length of the common chord of the circles $x^2 + y^2 + 2x + 3y + 1 = 0$ and $x^2 + y^2 + 4x + 3y + 2 = 0$ then the value of $[a]$. (where [-] denotes greatest integer function)

A. (a) $\frac{9}{2}$

B. (b) $\frac{3}{2}$

C. (c) $3\sqrt{2}$

D. (d) $2\sqrt{2}$

Answer: D

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12. about to only mathematics

A. $g^2 + f^2 - c$

B. $\sqrt{g^2 + f^2 - c}$

C. $\dfrac{g^2 + f^2 - c}{\sqrt{g^2 + f^2}}$

D. $\dfrac{1\left|g^2 + f^2 - c\right|}{2\sqrt{g^2 + f^2}}$

Answer: D

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13. Two perpendicular tangents to the circle $x^2 + y^2 = a^2$ meet at P. Then the locus of P has the equation

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

B. $x^2 + y^2 = 3a^2$

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

D. $x^2 + y^2 = 5a^2$

Answer: A

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14. about to only mathematics

A. $2(x^2 + y^2) = hx + ky$

B. $x^2 + y^2 = hx + ky$

C. $x^2 + y^2 + hx + ky = 0$

D. $x^2 + y^2 - hx + ky + 13 = 0$

Answer: B

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15. The equation of circle passing through the point $(1, 1)$ and point of intersection $x^2 + y^2 = 6$ and $x^2 + y^2 - 6x + 8 = 0$, is

A. $x^2 + y^2 - 6x + 4 = 0$

B. $x^2 + y^2 - 3x + 1 = 0$

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

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

Answer: B

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16. about to only mathematics

A. $2\sqrt{3}$

B. $\sqrt{3}$

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

D. 1

Answer: A

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17. A variable chord is drawn through the origin to the circle $x^2 + y^2 - 2ax = 0$. Find the locus of the center of the circle drawn on this chord as diameter.

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

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

C. $x^2 + y^2 + ax = 0$

D. $x^2 + y^2 - ax - ay = 0$

Answer: A

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18. Obtain the equation of the circle orthogonal to both the circles $x^2 + y^2 + 3x - 5y + 6 = 0$ and $4x^{\circ} + 4y^2 - 28x + 29 = 0$ and whose centre lies on the line $3x + 4y + 1 = 0$

A. $4x^2 + 4y^2 + 2y - 29 = 0$

B. $4x^2 + 4y^2 + 6y + 5 = 0$

C. $2x^2 + 2y^2 + 3x + 7y = 0$

D. $x^2 + y^2 + 3x - 7y + 3 = 0$

Answer: A

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19. The equation of a circle which touches the line $x + y = 5$ at $N(-2, 7)$ and cuts the circle $x^2 + y^2 + 4x - 6y + 9 = 0$ orthogonally, is

A. $x^2 + y^2 + 7x - 12y + m38 = 0$

B. $x^2 + y^2 + 7x + 11y + 38 = 0$

C. $x^2 + y^2 + 7x - 11y - 38 = 0$

D. $x^2 + y^2 - 7x - 11y + 39 = 0$

Answer: A

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20. If centre of a circle lies on the line $2x - 6y + 9 = 0$ and it cuts the circle $x^2 + y^2 = 2$ orthogonally then the circle passes through two fixed points

A. $\left(\frac{1}{2}, \frac{3}{2}\right), \left(\frac{-2}{5}, \frac{6}{5}\right)$

B. $(2, 3), (-2, 6)$

C. $\left(\frac{-1}{2}, \frac{3}{2}\right), \left(\frac{-2}{5}, \frac{6}{5}\right)$

D. $(-2, 3)(-2, 6)$

Answer: C

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21. The locus of the center of the circle which touches the circle $x^2 + y^2 - 6x - 6y + 14 = 0$ externally and also touches the y-axis is given by equation

A. $x^2 - 6x - 10y + 14 = 0$

B. $x^2 - 10x - 6y + 14 = 0$

C. $y^2 - 6x - 10y + 14 = 0$

D. $y^2 - 10x - 6y + 14 = 0$

Answer: D

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22. If $3x + y = 0$ is a tangent to a circle whose center is $(2, -1)$, then find the equation of the other tangent to the circle from the origin.

A. $x + 3y = 0$

B. $3x - y = 0$

C. $x - 3y = 0$

D. $x + 2y = 0$

Answer: C

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23. Find the area of the triangle formed by the tangents from the point (4, 3) to the circle $x^2 + y^2 = 9$ and the line joining their points of contact.

A. 12

B. 6

C. 4

D. $\frac{192}{25}$

Answer: D

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24. If the chord of contact of the tangents drawn from a point on the circle $x^2 + y^2 = a^2$ to the circle $x^2 + y^2 = b^2$ touches the circle $x^2 + y^2 = c^2$, then prove that a, b and c are in GP.

A. A.P

B. G.P

C. `H.P

D. AGP

Answer: B

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25. Find the locus of the point of intersection of tangents to the circle $x = a\cos\theta, y = a\sin\theta$ at the points whose parametric angles differ by $(i)\,\frac{\pi}{3}$,

A. Straight line

B. Ellipse

C. Circle is radius 2a

D. Circle of radiuis $\frac{2a}{\sqrt{3}}$

Answer: D

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26. A circle of constant radius 2r passes through the origin and meets the axes in 'P' and 'Q' Locus of the centroid of the $\triangle POQ$ is :

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

B. $9(x^2 + y^2) = 16r^2$

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

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

Answer: B

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27. A square is inscribed in the circle $x^2 + y^2 - 2x + 4y + 3 = 0$. Its sides are parallel to the coordinate axes. One vertex of the square is $(1 + \sqrt{2}, \ - 2)$ (b) $(1 - \sqrt{2}, \ - 2)$ $(1, \ - 2 + \sqrt{2})$ (d) none of these

A. $(1 + \sqrt{2}, \ - 2)$

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

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

D. $(2, \ - 1)$

Answer: D

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28. Two vertices of an equilateral triangle are $(-1, 0)$ and (1, 0), and its third vertex lies above the x-axis. The equation of its circumcircel is ________

A. $x^2 + y^2 - \frac{2y}{\sqrt{3}} - 1 = 0$

B. $x^2 + y^2 - \frac{y}{\sqrt{3}} - 1 = 0$

C. $x^2 + y^2 - \frac{2y}{3} - 1 = 0$

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

Answer: A

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29. If the chord $y = mx + 1$ of the circles $x^2 + y^2 = 1$ subtends an angle of 45^0 at the major segment of the circle, then the value of m is 2 (b) -2 (c) -1 (d) none of these

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

B. $-2 \pm \sqrt{2}$

C. $-1 \pm \sqrt{2}$

D. ± 1

Answer: D

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30. Tangents OP and OQ are drawn from the origin o to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$. Find the equation of the circumcircle of the triangle OPQ.

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

B. (g, f)

C. $(-f, -g)$

D. (f, g)

Answer: A

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31. The equation of the circle which passes through $(2a, 0)$ and has the radical axis $2x - a = 0$ withthe circie $x^2 + y^2 - a^2 = 0$ is

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

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

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

D. $x^2 + y^2 + ax = 0$

Answer: C

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32. Find the locus of mid-points of the chords of the circle $4x^2 + 4y^2 - 12x + 4y + 1 = 0$ that subtend an angle of $\frac{2\pi}{3}$ at its centre.

A. $16x^2 + 16y^2 - 48x + 16y + 31 = 0$

B. $16x^2 + 16y^2 + 48x + 48y + 31 = 0$

C. $16x^2 - 16y^2 + 48x + 48y + 31 = 0$

D. $16x^2 - 16y^2 - 48x + 16y - 31 = 0$

Answer: A

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33. Area of a circle in which a chord of length $\sqrt{2}$ makes an angle $\frac{\pi}{2}$ at the centre is

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

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

C. π

D. 2π

Answer: C

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34. If $3x + b_1y + 5 = 0$ and $4x + b_2y + 10 = 0$ cut the x-axis and y-axis in four concyclic, then the value of b_1b_2 is

A. (a)15

B. (b)30

C. (c)20

D. (d)12

Answer: D

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35. If the circle $x^2 + y^2 - 4x - 8y + 16 = 0$ rolls up the tangent to it at $\left(2 + \sqrt{3}, 3\right)$ by 2 units (assumes x-axis as horizontal), then the centre of the circle in the new position is

A. (3, 4)

B. $\left(3\sqrt{3}, 4+\sqrt{3}\right)$

C. $\left(3, 4+\sqrt{3}\right)$

D. $\left(3+\sqrt{3}, 4+\sqrt{3}\right)$

Answer: C

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36. If two tangents are drawn from a point to the circle $x^2+y^2=32$ to the circle $x^2+y^2=16$, then the angle between the tangents is

A. $\frac{-\pi}{4}$

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

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

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

Answer: C

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37. The radical centre of three circles described on the three sides $4x - 7y + 10 = 0$, $x + y = 5$ and $7x + 4y = 15$ of a triangle as diameters is

A. (a)(2, 3)

B. (b)(2, 1)

C. (c)(3, 2)

D. (d)(1, 2)

Answer: D

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38. Find the equation of the circle passing through $(1, 0) and (0, 1)$ and having the smallest possible radius.

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

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

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

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

Answer: B

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39. A line meets the co-ordinates axes at A(a, 0) and B(0, b) A circle is circumscribed about the triangle OAB. If the distance of the points A and B from the tangent at origin to the circle are 3 and 4 repectively, then the value of $a^2 + b^2 + 1$ is

A. (a)20

B. (b)30

C. (c)40

D. (d)50

Answer: D

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40. If the two circles $(x+1)^2+(y-3)^2=r^2$ and $x^2+y^2-8x+2y+8=0$ intersect at two distinct point,then (A) $r > 2$ (B) $2 < r < 8$ (C) $r < 2$ (D) $r = 2$

A. $1 < r < 4$

B. $-2 < r < 2$

C. $2 < r < 8$

D. None of these

Answer: C

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41. A circle of constant radius r passes through the origin O, and cuts the axes at A and B. The locus of the foots the perpendicular from O to AB is $(x^2 + y^2)^k = 4r^2x^2y^2$, Then the value of k is

A. 2

B. 1

C. 3

D. 4

Answer: C

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42. The point of intersection of the lines $x - y + 1 = 0$ and x + y + 5 = 0 is P. A circle with centre at (1, 0) passes through P. The tangent to the circle at P meets the x-axis at (k, 0). The value of k is

A. 2

B. -3

C. -2

D. -4

Answer: D

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43. The equation of one of the circles which touch the pair of lines $x^2 - y^2 + 2y - 1 = 0$ is

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

B. $x^2 + y^2 - 2x + 1 = 0$

C. $x^2 + y^2 + 2y - 1 = 0$

D. $x^2 + y^2 - 2y - 1 = 0$

Answer: C

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44. If the circle $x^2 + y^2 - 4x - 8y - 5 = 0$ intersects the line $3x - 4y = m$ at two distinct points, then find the values of m.

A. $-35 < k < 35$

B. $-35 < k < 15$

C. $-15 < k < 15$

D. $15 < k < 35$

Answer: B

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45. The number of points $(a+1, a)$ where $a \in I$, lying inside the region bounded $x^2 + y^2 - 2x - 15 = 0$ is

A. 2

B. 3

C. 1

D. 6

Answer: C

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46. Four distinct points (a, 0), (0, b), (c , 0) and (0, d) are lie on a plane in such a way that ac = bd, they will

A. Form a trapezium

B. Form a triangle

C. Lie on a circle

D. Form a quadrilateral, whose areas is zero

Answer: C

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47. The length of the chord of the parabola $y^2 = 12x$ passing through the vertex and making an angle of 60° with the axis of x is

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

B. 8

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

D. 4

Answer: B

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48. The length of the latus rectum of the parabola $x^2 - 6x + 5y = 0$ is

A. 3

B. 5

C. 7

D. 1

Answer: B

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49. The equation of tangent to the parabola $y^2 = 9x$, which pass through the point (4, 10) is

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

B. $9x + 4y + 4 = 0$

C. $x - 4y + 36 = 0$

D. $19x - 14y + 4 = 0$

Answer: C

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50. If the normals drawn at the points t_1 and t_2 on the parabola meet the parabola again at its point t_3, then $t_1 t_2$

equals.

A. 2

B. -1

C. -2

D. $t_3 - \frac{2}{t_3}$

Answer: A

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51. The line $4x - 7y + 10 = 0$ intersects the parabola $y^2 = 4x$ at the points P and Q. The coordinates of the point of intersection of the tangents drawn at the points P and Q are

A. $\left(-\frac{7}{2}, -\frac{5}{2}\right)$

B. $\left(\frac{5}{2}, \frac{7}{2}\right)$

C. $\left(-\frac{5}{2}, -\frac{7}{2}\right)$

D. $\left(\frac{7}{2}, \frac{5}{2}\right)$

Answer: B

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52. The coordinates of the point at which the line $x\cos\alpha + y\sin\alpha + a\sin\alpha = 0$ touches the parabola $y^2 = 4x$ are

A. $(a\tan\alpha, 2a\tan\alpha)$

B. $(2a\tan\alpha, a\tan\alpha)$

C. $(a \tan \alpha, \ -2a)$

D. $(a \cos \alpha, 2a \cos \alpha)$

Answer: C

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53. 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. $4al + n = 0$

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

C. $4am + n = 0$

D. $al + n = 0$

Answer: A

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

A. $3\sqrt{3}$

B. $6\sqrt{3}$

C. 2

D. 1

Answer: B

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55. Find the locus of the point of intersection of the normals at the end of the focal chord of the parabola $y^2 = 4ax$.

A. $y^2 = 4a(x - 3a)$

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

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

D. $y^2 = 16a(x - 3a)$

Answer: C

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

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

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

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

Answer: A

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57. about to only mathematics

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

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

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

D. 2

Answer: A

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58. vertex and focus of a parabola are (-1,1) and (2,3) respectively. find the equation of the directrix.

A. $3x + 2y + 14 = 0$

B. $3x + 2y - 25 = 0$

C. $2x - 3y + 10 = 0$

D. $x - y + 5 = 0$

Answer: A

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

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

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

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

D. 4

Answer: B

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60. The curve is given by $x = \cos 2t, \, y = \sin t$ represents

A. A parabola

B. Circle

C. Part of a parabola

D. A pair of straight lines

Answer: C

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61. The vertex of the parabola $y^2 = (a-b)(x-a)$ is

A. (b, a)

B. (a , b)

C. (a, 0)

D. (b , 0)

Answer: C

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62. Two common tangents to the circle $x^2 + y^2 = \frac{a^2}{2}$ and the parabola $y^2 = 4ax$ are

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

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

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

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

Answer: D

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63. If the length of a focal chord of the parabola $y^2 = 4ax$ at a distance b from the vertex is c, then prove that $b^2c = 4a^3$.

A. $a^2 = bc$

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

C. $b^2 = ac$

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

Answer: D

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64. 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. $a < 4$

B. $0 < a < 4$

C. $0 < a < 2$

D. $a > 4$

Answer: B

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65. 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. $m_1=m_2$

Answer: C

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66. The coordinates of a point on the parabola $y^2 = 8x$ whose distance from the circle $x^2 + (y+6)^2 = 1$ is minimum is $(2, 4)$ (b) $(2, \ -4)$ $(18, \ -12)$ (d) $(8, 8)$

A. $(2, 4)$

B. $(\,-2, 4)$

C. $(2, \ -4)$

D. $(\,-2, \ -4)$

Answer: C

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67. If a circle intersects the parabola $y^2 = 4ax$ at points $A\left(at_1^2, 2at_1\right), B\left(at_2^2, 2at_2\right), C\left(at_3^2, 2at_3\right), D\left(at_4^2, 2at_4\right)$, then $t_1 + t_2 + t_3 + t_4$ is

A. 1

B. -1

C. 0

D. 2

Answer: C

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68. If the line $y - \sqrt{3x} + 3 = 0$ cuts line parabola $y^2 = x + 2$ at A and B, thren find the value of PA.PB { where $P = (\sqrt{3}, 0)$}

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

B. $2\sqrt{3}$

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

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

Answer: D

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

A. A circle

B. A parabola

C. A pair of straight lines

D. A hyperbola

Answer: D

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71. The normal at any point $P(t^2, 2t)$ on the parabola $y^2 = 4x$ meets the curve again at Q, then the $area(\triangle POQ)$ in the form of $\frac{k}{|t|}(1+t^2)(2+t^2)$. the value of k is

A. $k > 2$

B. k = 2

C. $k < 2$

D. k = 1

Answer: B

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72. A ray of light moving parallel to x-axis gets reflected from a parabolic mirror whose equation is $4(x + y) - y^2 = 0$. After reflection the ray pass through the $pt(a, b)$. Then the value of a + b is

A. 2

B. 1

C. -2

D. -1

Answer: A

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

Answer: B

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74. The mirror image of the focus to the parabola $4(x+y) = y^2$ w.r.t. the directrix is

A. (0, 2)

B. (2, 2)

C. (-4, 2)

D. (-2, 2)

Answer: C

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75. A tangent to the parabola $y^2 = 8x$ makes an angle of 45^0 with the straight line $y = 3x + 5$. Then find one of the points of contact.

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

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

C. $x + y + 2 = 0$

D. $x + y + 1 = 0$

Answer: B

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76. Find the point on the curve $y^2 = 4x$ which is nearest to the point (2, 1).

A. $(1, \ -2)$

B. $(-2, 1)$

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

D. $(1, 2)$

Answer: D

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77. The parametric coordinates of a point on the ellipse, whose foci are $(-3, 0)$ and (9, 0) and eccentricity $\frac{1}{3}$, are

A. $(-3+9\cos\theta, 9\sin\theta)$

B. $(4-3\cos\theta, 4+9\sin\theta)$

C. $(3+18\cos\theta, 4+9\sin\theta)$

D. $\left(3+18\cos\theta, 12\sqrt{2}\sin\theta\right)$

Answer: D

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78. The number of values of c such that the straight line $y=4x+c$ touches the curve $\frac{x^2}{4}+\frac{y^2}{1}=1$ is (a) 0 (b) 1 (c) 2 (d) infinite

A. 0

B. 1

C. 2

D. Infinite

Answer: C

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79. The locus of mid points of parts in between axes and tangents of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$will be

A. $\frac{a^2}{x^2} + \frac{b^2}{y^2} = 4$

B. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 4$

C. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 16$

D. $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 25$

Answer: A

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80. The equation of the chord of the ellipse $x^2 + 4y^2 = 4$ having the middle point at $\left(-2, \dfrac{1}{2}\right)$ is

A. $2x - 2y + 7 = 0$

B. $x + 2y = 0$

C. $3x - 2y + 4 = 0$

D. $2x - 2y + 5 = 0$

Answer: D

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81. The equation of the passing through the of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 9$, and having centre at (0,3) is :

A. 4

B. 3

C. $\sqrt{12}$

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

Answer: A

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82. If two points are taken on the minor axis of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the same distance from the center as the foci, then prove that the sum of the squares of the perpendicular distances from these points on any tangent to the ellipse is $2a^2$.

A. a^2

B. b^2

C. $2a^2$

D. $2b^2$

Answer: C

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83. Find the locus of the foot of the perpendicular drawn from the center upon any tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$

A. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

B. $x^2 + y^2 = a^2 + b^2$

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

D. None of these

Answer: C

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

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

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

Answer: C

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85. The line $lx+my+n=0$ is a normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. then prove that $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2-b^2)^2}{n^2}$

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

B. $\frac{a^2}{l^2}+\frac{b^2}{m^2}=\frac{(a^2-b^2)^2}{n^2}$

C. $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{\left(a^2 - b^2\right)^2}{n^2}$

D. None of these

Answer: B

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86. The tangent at a point $P(a\cos\varphi, b\sin\varphi)$ of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ meets its auxiliary circle at two points, the chord joining which subtends a right angle at the center. Find the eccentricity of the ellipse.

A. $1 + \cos^2\alpha$

B. $\frac{1}{\sqrt{1 + \sin^2\alpha}}$

C. $\frac{1}{\sqrt{1 + \cos^2\alpha}}$

D. $1+\sin^2\alpha$

Answer: B

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87. From a point P, two tangents are drawn to the parabola $y^2=4ax$. If the slope of one tagents is twice the slope of other, the locus of P is

A. Circle

B. Straight line

C. Parabola

D. Ellipse

Answer: C

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88. The centre of the ellipse $4x^2 + 9y^2 + 16x - 18y - 11 = 0$ is

A. $(-2, -1)$

B. $(-2, 1)$

C. $(2, -1)$

D. $(2, 1)$

Answer: B

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89. The length of the latus rectum of the ellipse $2x^2 + 3y^2 - 4x - 6y - 13 = 0$ is

A. 5

B. 4

C. 8

D. 12

Answer: B

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90. The co-ordinates of foci of an ellipse $3x^2 + 4y^2 + 12x + 16y - 8 = 0$ is :

A. 2/3+

B. $(-2, -2)$

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

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

Answer: A

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91. If the line joining foci subtends an angle of 90° at an extremity of minor axis, then the eccentricity e is

A. $\dfrac{1}{\sqrt{6}}$

B. $\dfrac{1}{\sqrt{3}}$

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

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

Answer: C

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92. In an ellipse the distance between the foci is 8 and the distance between the directrices is 25, then the ratio of the length of major and minor axis is

A. $\frac{5}{\sqrt{17}}$

B. $\frac{3}{\sqrt{17}}$

C. $\frac{4}{\sqrt{17}}$

D. $\frac{6}{\sqrt{17}}$

Answer: A

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93. The area (in sq units) of the quadrilateral formed by the tangents at the end points of the latus rectum to the ellipse $\frac{x^2}{9} + \frac{y^2}{5} = 1$ is

A. 27

B. $\frac{27}{2}$

C. $\frac{27}{4}$

D. $\frac{27}{55}$

Answer: A

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94. The tangent at any point on the ellipse $16x^2 + 25y^2 = 400$ meets the tangents at the ends of the major axis at T_1 and T_2. The circle on T_1T_2 as diameter passes through

A. (3, 0)

B. (0, 0)

C. (0, 3)

D. (4, 0)

Answer: A

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95. If tangents are drawn to the ellipse $2x^2 + 3y^2 = 6$, then the locus of the mid-point of the intercept made by the tangents between the co-ordinate axes is

A. $\frac{1}{4x^2} + \frac{1}{2y^2} = 1$

B. $\frac{3}{4x^2} + \frac{1}{2y^2} = 1$

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

D. $\frac{1}{x^2} + \frac{3}{4y^2} = 1$

Answer: B

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96. The minimum area of the triangle formed by the tangent to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ and the co-ordinate axes is

A. 16

B. 9

C. 12

D. 144

Answer: C

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97. The number of common tangents to the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and the circle $x^2 + y^2 = 4$ is

A. 2

B. 1

C. 0

D. 4

Answer: C

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98. If the focal distance of an end of the minor axis of an ellipse (referred to its axes as the axes of x and y , respectively) is k and the distance between its foci is $2h$, them find its equation.

A. $\frac{x^2}{h^2} + \frac{y^2}{k^2} = 1$

B. $\frac{x^2}{k^2} + \frac{y^2}{k^2 - h^2} = 1$

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

D. $\frac{x^2}{h^2} + y^2 = 1$

Answer: B

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99. Number of points on the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ from which pair of perpendicular tangents are drawn to the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ is

A. 2

B. 3

C. 4

D. 1

Answer: A

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100. Area of the region bounded by the curve $\left\{(x, y): \frac{x^2}{a^2}+\frac{y^2}{b^2} \leq 1 \leq \frac{x}{a}+\frac{y}{b}\right\}$ is

A. $\left(\frac{\pi}{4}-\frac{1}{2}\right)ab$

B. $\left(\frac{\pi}{4}+\frac{1}{2}\right)ab$

C. $\left(\frac{\pi}{4}-\frac{1}{3}\right)ab$

D. $\frac{\pi}{4}ab$

Answer: A

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101. The ellipse $x^2 4y^2 = 4$ is inscribed in a rectangle aligned with the coordinates axes, whicj in turn is inscribed in another ellipse that passes through the point (0,0). Then, the equation of the ellipse is

A. $x^2 + 12y^2 = 16$

B. $4x^2 + 48y^2 = 48$

C. $4x^2 + 64y^2 = 48$

D. $x^2 + 16y^2 = 16$

Answer: A

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102. P is any variable point on the ellipse $4x^2 + 9y^2 = 36$ and F_1, F_2 are its foci. Maxium area of $\triangle PF_1F_2$ (e is eccentricity of ellipse)

A. 9e

B. 4e

C. 6e

D. 10e

Answer: C

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

A. A pair of straight lines

B. An ellipse

C. A hyperbola

D. A parabola

Answer: D

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104. about to only mathematics

A. $y = x + 2$

B. $y = 2x + 1$

C. $y = \frac{x}{2} + 4$

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

Answer: A

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105. AB is double ordinate of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ such that ΔAOB(where 'O' is the origin) is an equilateral triangle, then the eccentricity e of hyperbola satisfies:

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

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

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

D. $1 < e < \frac{2}{\sqrt{3}}$

Answer: A

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106. Find the equation to the hyperbola whose foci, are (6,4) and (-4,4) and eccentricity is 2.

A. $12(x-1)^2 - 4(y-4)^2 = 75$

B. $12(x+1)^2 - 4(y+4)^2 = 75$

C. $4(x-1)^2 - 1(y-4)^2 = 75$

D. $4(x+1)^2 - 12(y+4)^2 = 75$

Answer: A

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107. The equation of the tangent to the hyperbola $3x^2 - 4y^2 = 12$, which makes equal intercepts on the axes is

A. $x = y + 1 = 0$

B. $x + y + 1 = 0$

C. $x + y - 1 = 0$

D. All are correct

Answer: D

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108. The equation $\frac{x^2}{1-r} - \frac{y^2}{1+r} = 1, r > 1,$ represents an ellipse (b) a hyperbola a circle (d) none of these

A. An ellipse

B. A hyperbola

C. A circle

D. None of these

Answer: D

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109. The equation of the hyperbola with centre at (0, 0) and co-ordinate axes as its axes, distance between the directrices being $\frac{4}{\sqrt{3}}$ and passing through the point (2, 1), is

A. $3x^2 + 2y^2 = 10$

B. $3x^2 - 2y^2 = 2$

C. $2x^2 - 3y^2 = 10$

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

Answer: A

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110. The equation of the tangent to the hyperbola $3x^2 - 8y^2 = 24$ and perpendicular to the line $3x - 2y = 4$ is

A. $3x + 2y \pm \sqrt{5} = 0$

B. $2x + 3y \pm \sqrt{7} = 0$

C. $2x + 3y \pm 2 = 0$

D. $2x + 3y \pm \sqrt{5} = 0$

Answer: D

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111. Find the locus of a point $P(\alpha, \beta)$ moving under the condition that the line $y = ax + \beta$ is a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.

A. An ellipse

B. A circle

C. A parabola

D. A hyperbola

Answer: D

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112. The locus of the middle points of the chords of hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$, which pass through the fixed point (1, 2) is a hyperbola whose eccentricity is

A. (a) $\frac{3}{2}$

B. (b) $\frac{\sqrt{7}}{2}$

C. (c) $\frac{\sqrt{13}}{2}$

D. (d) $\frac{\sqrt{15}}{2}$

Answer: C

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A. $\dfrac{a^2+b^2}{a}$

B. $-\left(\dfrac{a^2+b^2}{a}\right)$

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

D. $-\left(\dfrac{a^2+b^2}{b}\right)$

Answer: D

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114. about to only mathematics

A. $\dfrac{\left(x-\frac{1}{3}\right)^2}{\frac{1}{9}}+\dfrac{(y-1)^2}{\frac{1}{12}}=1$

B. $\dfrac{\left(x-\frac{1}{3}\right)^2}{\frac{1}{8}}+\dfrac{(y-1)^2}{\frac{1}{12}}=1$

C. $\dfrac{\left(x-\frac{1}{3}\right)^2}{\frac{1}{9}}+\dfrac{(y-1)^2}{\frac{1}{8}}=1$

D. None of these

Answer: A

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115. IF t is a parameter, then $x=a\left(t+\dfrac{1}{t}\right)$ and $y=b\left(t-\dfrac{1}{t}\right)$ represents

A. An ellipse

B. A parabola

C. A hyperbola

D. A circle

Answer: C

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116. If $3x^2 - 5y^2 - 6x + 20y - 32 = 0$ represents a hyperbola, then the co-ordinates of foci are

A. $(\pm 2\sqrt{2}, 0)$

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

C. $(0, \pm 2\sqrt{2})$

D. $(1, 2)$

Answer: B

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117. IF the locus of the point of intersection of two perpendicular tangents to a hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$ is a circle with centre (0, 0), then the radius of a circle is

A. 5

B. 4

C. 3

D. 7

Answer: C

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118. If the line $y = mx + \sqrt{a^2m^2 - b^2}$, $m = \frac{1}{2}$ touches the hyperbola $\frac{x^2}{16} - \frac{y^2}{3} = 1$ at the point $\left(4\sec\theta, \sqrt{3}\tan\theta\right)$ then θ is

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

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

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

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

Answer: C

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119. about to only mathematics

A. $y\sqrt{7} = \sqrt{2}x + 15$

B. $y\sqrt{7} = 3\sqrt{2}x + 15$

C. $y = 3\sqrt{2}x + 15$

D. $y\sqrt{7} = 3x + 15$

Answer: B

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120. Area of the triangle formed by any arbitrary tangents of the hyperbola $xy = 4$, with the co-ordinate axes is

A. 2

B. 4

C. 6

D. 8

Answer: D

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121. If the normal to the rectangular hyperbola $xy = 4$ at the point $\left(2t, \frac{2}{t_1}\right)$ meets the curve again at $\left(2t_2, \frac{2}{t_2}\right)$, then

A. $t_1^{\ 3} t_2 = 1$

B. $t_1^{\ 3} t_2 = -1$

C. $t_2^{\ 3} t_1 = 1$

D. $t_1 t_2^3 = -1$

Answer: B

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SECTION-C (Objective Type Questions (More than one answer))

1. A square is inscribed in the circle $x^2 + y^2 - 2x + 4y - 93 = 0$ with its sides parallel to the coordinate axes. The coordinates of its vertices are

$(-6, -9), (-6, 5), (8, -9), (8, 5)$

$(-6, -9), (-6, -5), (8, -9), (8, 5)$

$(-6, -9), (-6, 5), (8, 9), (8, 5)$

$(-6, -9), (-6, 5), (8, -9), (8, -5)$

A. $(-6, -9)$

B. $(-6, 5)$

C. $(8, -9)$

D. (8, 5)

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

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SECTION-C

1. An equation of a line passing through the point $(-2, 11)$ and touching the circle $x^2 + y^2 = 25$ is

A. $4x + 3y = 25$

B. $3x + 4y = 38$

C. $24x - 7y + 125 = 0$

D. $7x + 24y - 230 = 0$

Answer: A::C

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2. Find the equation of the tangent to the circle $x^2 + y^2 + 4x - 4y + 4 = 0$ which makes equal intercepts

on the positive coordinates axes.

A. $x - y = 2\sqrt{2}$

B. $x + y = 2\sqrt{2}$

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

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

Answer: B::D

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3. If a chord of the circle $x^2 + y^2 - 4x - 2y - c = 0$ is trisected at the points $\left(\frac{1}{3}, \frac{1}{3}\right)$ and $\left(\frac{8}{3}, \frac{8}{3}\right)$ then

A. Length of the chord $= 7\sqrt{2}$

B. k = 20

C. Radius of the circle = 5

D. $k = 25$

Answer: A::B::C

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4. Find the equation of a circle with center (4, 3) touching the circle $x^2 + y^2 = 1$

A. $x^2 + y^2 - 8x - 6y + 9 = 0$

B. $x^2 + y^2 + 8x + 6y - 11 = 0$

C. $x^2 + y^2 - 8x - 6y - 11 = 0$

D. $x^2 + y^2 + 8x + 6y - 9 = 0$

Answer: A::C

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5. An equation of a circle through the origin, making an intercept of $\sqrt{10}$ on the line $y = 2x + \frac{5}{\sqrt{2}}$, which subtends an angle of 45° at the origin is

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

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

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

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

Answer: B::D

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6. about to only mathematics

A. $x = 0$

B. $y - 4 = 0$

C. $3x + 4y = 10$

D. $4x - 3y = 0$

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

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7. Show that the common tangents to the circles $x^2 + y^2 - 6x = 0$ and $x^2 + y^2 + 2x = 0$ form an equilateral triangle.

A. $x = 1$

B. $x = 0$

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

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

Answer: B::C::D

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8. The following equilibria are given by

rho$N_2 + 3H_2 \Leftrightarrow 2NH_3 : K_1$

$$N_2 + O_2 \Leftrightarrow 2NO, K_2$$

$$H_2 + \frac{1}{2}O_2 \Leftrightarrow H_2O, K_3$$

The equlibrium constant of the reaction

$$2NH_3 + \frac{5}{2}O_2 \Leftrightarrow 2NO + 3H_2O$$

in terms of K_1 and K_3 is

A. Equation of common chord is $x + 2y - 9 = 0$

B. Equation of common chord is $x + 2y + 7 = 0$

C. Point of intersection of tangents at A and B to $C_1 is \left(\frac{25}{9}, \frac{50}{9}\right)$.

D. C_1, C_2 have four common tangents

Answer: A::C

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9. Two circles $x^2 + y^2 + ax + ay - 7 = 0$ and $x^2 + y^2 - 10x + 2ay + 1 = 0$ will cut orthogonally if the value of a is

A. 3

B. 2

C. -2

D. -3

Answer: A::B

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10. The positive integral value of λ, for which line $4x+3y-16\lambda=0$ lies between the circles $x^2+y^2-4x-4y+4=0$ and $x^2+y^2-20x-2y+100=0$, and does not intersect either of the circles, may be

A. (a)27

B. (b)30

C. (c)33

D. (d)36

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

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11. If the area of a quadrilateral formed by the tangents from the origin to $x^2 + y^2 + 6x - 10y + \lambda = 0$ and the pair of radii at the points of contact of these tangents to the circle, is 8 cm^2, then the value of λ must be

A. 2

B. 4

C. 16

D. 32

Answer: A::D

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12. If

$(a\cos\theta_1, a\sin\theta_1), (a\cos\theta_2, a\sin\theta_2), (a\cos\theta_3, a\sin\theta_3)$

represents the vertices of an equilateral triangle inscribed

in $x^2 + y^2 = a^2$, then

A. $\sum \cos\theta_i = 0$

B. $\sum \sin\theta_i = 0$

C. $\sum \tan\theta_i = 0$

D. $\sum \cot\theta_i = 0$

Answer: A::B

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13. Equation of tangents drawn from $(0, 0)$ to $x^2 + y^2 - 6x - 6y + 9 = 0$ are

A. x = y

B. y = 0

C. x = 0

D. $x + y = 0$

Answer: B::C

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14. The locus of the centre of the circle which moves such that it touches the circle $(x + 1)^2 + y^2 = 1$ externally and also the y-axis is

A. $y^2 = 4x, x \geq 0$

B. $y^2 = -4x, x \leq 0$

C. $y = 0, x > 0$

D. $y = 0, \forall x \in R$

Answer: B::C

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15. If a point $\left(a, \sqrt{a}\right)$ lies in region bounded between the circles $x^2 + y^2 + 4x + 4y + 7 = 0$ and $x^2 + y^2 + 4x + 4y - 1 = 0$, then the number of integral values of a exceeds

A. 0

B. 1

C. 2

D. 3

Answer: A

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16. Tangents and normal from a point (3, 1) to circle C whose equation $x^2 + y^2 - 2x - 2y + 1 = 0$ Let the points of contact of tangents be $T_i(x_i, (y_i),$ where $I = 1, 2$ and feet of normal be N_1 and $N_2(N_1 \text{ is near} P)$

Tangents ared drawn at N_1 and N_2 and normals are drawn at T_1 and T_2

A. $x_1 + x_2 + y_1 + y_2 = 5$

B. $x_1 x_2 y_1 y_2 = -\frac{9}{16}$

C. Normal at T_1 and tangents at T_2 and N_2 are concurrent

D. Circle is incircle of the triangle formed by tangents from P and tangent at N_2

Answer: A::C::D

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17. C_1 and C_2 are two concentric circles, the radius of C_2 being twice that of C_1. From a point P on C_2, tangents PA and PB are drawn to C_1. Prove that the centroid of triangle PAB lies on C_1.

A. Centroid of $\triangle PQR$ lies on C_1

B. $Orthocentreof$trianglePQR$lieson$C_(1)`

C. If radius of C_1 is $\sqrt{3}$ then area of $\triangle PQR$ is $\frac{9\sqrt{3}}{4}$ sq. units

D. If radius of C_1 is $\sqrt{3}$ then area of $\triangle PQR$ is $\frac{27}{4}$ sq. units

Answer: A::B::C

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18. The equation (s) of common tangents (s) to the two circles $x^2 + y^2 + 4x - 2y + 4 = 0$ and $x^2 + y^2 + 8x - 6y + 24 = 0$ is/are

A. (a)$x + 3 = 0$

B. (b)$y - 2 = 0$

C. (c)$x + y = \sqrt{2} - 1$

D. (d)$x + y + \sqrt{2} + 1 = 0$

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

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19. The equation (s) of circle (s) touching $12x - 5y = 7$ at (1, 1) and having radius 13 is/are

A. $x^2 + y^2 - 22x + 12y - 1 = 0$

B. $x^2 + y^2 + 22x - 12y - 12 = 0$

C. $x^2 + y^2 - 26x - 8y + 16 = 0$

D. $x^2 + y^2 - 26x + 8y + 16 = 0$

Answer: B::D

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20. Let circle cuts ortholognally each of the three circles

$x^2 + y^2 + 3x + 4y + 11 = 0, x^2 + y^2 - 3x + 7y - 1 = 0$

and $x^2 + y^2 + 2x = 0$

A. The centre of the circle is $(-3, -2)$

B. Radius of the circle is 3

C. Equation of chord of contact of tangents drawn from $(2, 4)$ is $5x + 6y - 18 = 0$

D. Length of tangent from (2, 4) to the circle is $\sqrt{3}$

Answer: A::B

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21. The equation of a circle touching x-axis at $(-4, 0)$ and cutting off an intercept of 6 units on y-axis can be

A. $x^2+y^2+8x+12y+16=0$

B. $x^2+y^2+8x-12y+16=0$

C. $x^2+y^2+8x+10y+16=0$

D. $x^2+y^2+8x-10y+16=0$

Answer: C::D

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22. Let one of the vertices of the square circumseribing the circle $x^2+y^2-6x-4y+11=0$ be $\left(4, 2+\sqrt{3}\right)$ The other vertices of the square may be

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

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

C. $\left(3+\sqrt{3}.\ 1\right)$

D. $(0, 0)$

Answer: A::B::C

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23. IF $x^2+y^2-2y-15+\lambda(2x+y-9)=0$ represents family of circles for. Different values of λ, then the equation of the circle(s) along these circles having minimum radius is/are

A. $3x^2+3y^2-2x-7y-36=0$

B. $x^2+y^2-2y-15=0$

C. $5x^2+5y^2-32x-26y+69=0$

D. $x^2 + y^2 - 10x - 7y + 30 = 0$

Answer: C

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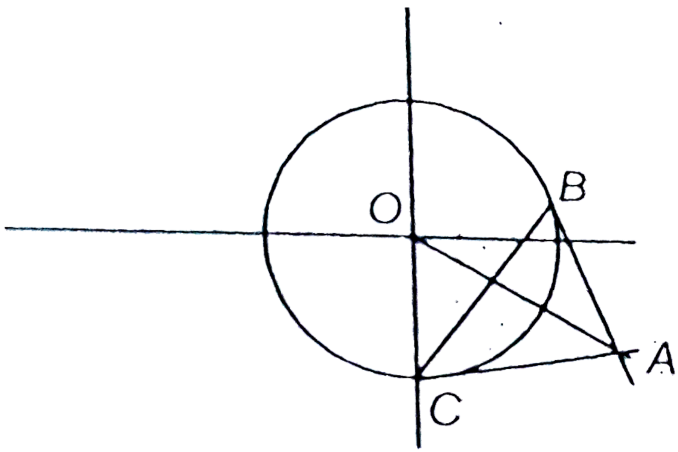
24. Let the midpoint of the chord of contact of tangents drawn from A to the circle $x^2 + y^2 = 4$ be $M(1, -1)$ and the points of contact be B and C



A. The area of $\triangle ABC$ is 2 sq. units

B. The area of $\triangle ABC$ is $\frac{1}{2}$ sq. units

C. Co-ordinate of point A is $(2, -2)$

D. $\triangle ABC$ is right angled triangle

Answer: A::C::D

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25. $y^2 - 2x - 2y + 5 = 0$ represents

A. A pair of straight line

B. A circle with centre (1, 1)

C. A parabola with vetex (2, 1)

D. A parabola with directrix $x = \frac{3}{2}$

Answer: C::D

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26. If tangents PA and PB are drawn from $P(-1, 2)$ to $y^2 = 4x$ then

A. Equation of AB is $y = x - 1$

B. Length of AB is 8

C. Length of AB is 4

D. Equation of AB is $y = x + 1$

Answer: A::B

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

A. 1

B. -1

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

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

Answer: A::B

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28. The normal to parabola $y^2 = 4ax$ from the point $(5a, \ -2a)$ are

A. $y = \ -x + 3a$

B. $y = 2x - 12a$

C. $y = 3x + 33a$

D. $y = x + 3a$

Answer: A::B

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29. The coordinates of a focus of the ellipse $4x^2 + 9y^2 = 1$ are

A. $\left(\frac{\sqrt{5}}{6}, 0\right)$

B. $\left(-\frac{\sqrt{5}}{6}, 0\right)$

C. $\left(\frac{\sqrt{3}}{6}, 0\right)$

D. $\left(-\frac{\sqrt{3}}{6}, 0\right)$

Answer: A::B

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30. On the ellipse $4x^2 + 9y^2 = 1$, the points at which the tangents are parallel to the line $8x = 9y$ are (a) $\left(\frac{2}{5}, \frac{1}{5}\right)$ (b) $\left(-\frac{2}{5}, \frac{1}{5}\right)$ $\left(-\frac{2}{5}, -\frac{1}{5}\right)$ (d) $\left(\frac{2}{5}, -\frac{1}{5}\right)$

A. $\left(\frac{2}{5}, \frac{1}{5}\right)$

B. $\left(-\frac{2}{5}, \frac{1}{5}\right)$

C. $\left(-\frac{2}{5}, -\frac{1}{5}\right)$

D. $\left(\frac{2}{5}, -\frac{1}{5}\right)$

Answer: B::D

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31. Let P be a variable on the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ with foci at F_1 and F_2

A. (a)Area of $\triangle PF_1F_2$ is $12 \sin \theta$

B. (b)Area of $\triangle PF_1F_2$ is maximum when $\theta = \frac{\pi}{2}$

C. (c)Co-ordinate of P are (0, 4)

D. (d)Centre of the ellipse is (1, 2)

Answer: A::B::C

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32. The area (in sq units) of the quadrilateral formed by the tangents at the end points of the latus rectum to the ellipse $\frac{x^2}{9} + \frac{y^2}{5} = 1$ is

A. Co-ordinates of one of a latus rectum are $\left(2, \frac{5}{3}\right)$

B. Equation of tangent is $\frac{2}{9}x + \frac{y}{3} = 1$

C. Area of a quadrilateral so formed is 27 sq. units

D. Centre of the ellipse is (2, 3)

Answer: A::B::C

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33. The equation of common tangent of the curve $x^2 + 4y^2 = 8$ and $y^2 = 4x$ are

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

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

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

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

Answer: A::B

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

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

B. $23x - 3y - 22 = 0$

C. $3x - 23y + 178 = 0$

D. $3x + y + 14 = 0$

Answer: A::B

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35. If the circle $x^2 + y^2 = a^2$ intersects the hyperbola $xy = c^2$ at four points $P(x_1, y_1), Q(x_2, y_2), R(x_3, y_3),$

and $S(x_4, y_4)$, then $x_1 + x_2 + x_3 + x_4 = 0$

$y_1 + y_2 + y_3 + y_4 = 0$ $x_1 x_2 x_3 x_4 = C^4$ $y_1 y_2 y_3 y_4 = C^4$

A. $\Sigma x_i = 0$

B. $\Sigma y_i = 0$

C. $x_1 x_2 x_3 x_4 = C^4$

D. $y_1 y_2 y_3 y_4 = C^4$

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

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36. The angle between a pair of tangents drawn from a point P to the hyperbola $y^2 = 4ax$ is 45°. Show that the locus of the point P is hyperbola.

A. $(a, 0)$

B. $(-7a, 0)$

C. $(4a, 0)$

D. $(-4a, 0)$

Answer: A::B

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37. Tangents at any point P is drawn to hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ intersects asymptotes at Q and R, if O is the centre of hyperbola then

A. Area of triangle OQR is ab

B. Area of triangle OQR is 2ab

C. P is mid-point of QR

D. P trisect QR

Answer: A::C

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38. A normal to the hperbola $\frac{X^2}{a^2} - \frac{y^2}{b^2} = 1$ meets the axes at M and N and lines MP and NP are drawn perpendicular to the axes meeting at P. Prove that the locus of P is the hyperbola $a^2x^2 - b^2y^2 = (a^2 + b^2)^2$.

A. e' is eccentricity of conjugate of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

B. $\frac{1}{e^2} + \frac{1}{e^2} = 1$

C. $e^2 + e'^2 = 3$

D. $e^2 + e'^2 = 4$

Answer: A::B

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39. If one of varying central conic (hyperbola) is fixed in magnitude and position, prove that the locus of the point of contact of a tangent drawn to it from a fixed point on the other axis is a parabole.

A. Parabola

B. Ellipse

C. Hyperbola

D. Straight line

Answer: C::D

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40. For the equation of rectangular hyperbola $xy = 18$

A. Length of transverse axis = length of conjugate axis = 12

B. Vertices are $(3\sqrt{2}, 3\sqrt{2})$ or $(-3\sqrt{2}, -3\sqrt{2})$

C. Foci are $(6+6), (-6, -6)$

D. Equation of tangent with slope 1 cannot be possible

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

41. The equation of the asymptotes of a hyperbola are $4x - 3y + 8 = 0$ and $3x + 4y - 7 = 0$, then

A. (a)Eccentricity is $\sqrt{2}$

B. (b)Centre is $\left(\frac{-11}{25}, \frac{52}{25}\right)$

C. (c)Centre is $\left(\frac{11}{25}, \frac{-52}{25}\right)$

D. (d)Equation of axes $x - 7y + 15 = 0$ and $7x + y + 1 = 0$

Answer: A::B::D

42. The feet of the normals to $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ from (h, k) lie on

A. (a)$a^2y(x-h) + b^2x(y-k) = 0$

B. (b)$b^2x(x-h) + a^2y(y-k) = 0$

C. (c)$(a^2+b^2)xy - a^2hy - b^2xk = 0$

D. (d)None of these

Answer: A::C

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43. If the tangent at the point $(a\sec\alpha, b\tan\alpha)$ to the hyberbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ meets the transverse axis at T.

Then the distances of T form a focus of the hyperbola is

A. $a(e - \cos\alpha)$

B. $b(e + \cos\alpha)$

C. $a(e + \cos\alpha)$

D. $\sqrt{a^2e^2 + b^2\cot^2\alpha}$

Answer: A::C

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44. If equation of hyperbola is $4(2y - x - 3)^2 - 9(2x + y - 1)^2 = 80$, then

A. Eccentricity is $\frac{\sqrt{13}}{3}$

B. Centre of hyperbola is $\left(-\frac{7}{5}, -\frac{7}{5}\right)$

C. Transverse axis is $2x + y - 1 = 0$

D. Conjugate axis is $x - 2y + 3 = 0$

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

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SECTION -D

1. A circle C_1 of radius 2 units rolls o the outerside of the circle $C_2 : x^2 + y^2 + 4x = 0$ touching it externally.

The locus of the centre of C_1 is

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

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

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

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

Answer: B

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2. A circle C_1 of radius 2 units rolls o the outerside of the circle $C_2 : x^2 + y^2 + 4x = 0$ touching it externally.

Area of a quadrilateral found by a pair of tangents from a point of $x^2 + y^2 + 4x - 12 = 0$ to C_2 with a pair of radii at the points of contact of the tangents is (in sq. units)

A. $2\sqrt{3}$

B. $4\sqrt{3}$

C. $\sqrt{3}$

D. $3\sqrt{3}$

Answer: B

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3. A circle C_1 of radius 2 units rolls o the outerside of the circle $C_2 : x^2 + y^2 + 4x = 0$ touching it externally.

Square of the length of the intercept made by $x^2 + y^2 + 4x - 12 = 0$ on any tangents to C_2 is

A. (a)12

B. (b)24

C. (c)16

D. (d)48

Answer: D

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4. Prove that the equation $x^2 + y^2 - 2x - 2ay - 8 = 0, a \in R$ represents the family of circles passing through two fixed points on x-axis.

A. $(-2, 0), (4, 0)$

B. $(2, 0), (4, 0)$

C. $(-4, 0), (4, 0)$

D. $(2, 0), (-4, 0)$

Answer: A

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5. Consider the family of circles $x^2 + y^2 - 2x - 2ay - 8 = 0$ passing through two fixed points A and B . Also, $S = 0$ is a cricle of this family, the tangent to which at A and B intersect on the line $x + 2y + 5 = 0$.

The distance between the points A and B , is

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

B. $x^2 + y^2 - 2x + 6y - 8 = 0$

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

D. $x^2 + y^2 - 2x - 6y - 8 = 0$

Answer: D

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6. $C : x^2 + y^2 - 2x - 2ay - 8 = 0$, a is a variable

Equation of circle of this family intersects on the line x + 2y + 5 = 0 If the chord joining the fixed points substends an angle θ at the centre of the circle C_1. Then θ equals

A. a) 30°

B. B) 45°

C. C) 60°

D. D) 90°

Answer: D

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7. Two parabolas C and D intersect at two different points, where C is $y = x^2 - 3$ and D is $y = kx^2$. The intersection at which the x value is positive is designated Point A, and x=a at this intersection the tangent line l at A to the curve D intersects curve C at point B , other than A. IF x-value of point B is 1, then a equal to

A. $2(a^3 - 3)x - ay + (a^3 - 3a) = 0$

B. $2(a^2 - 3)x - ay - a^3 + 3a = 0$

C. $(a^3 - 3)x - 2ay - 2a^3 + 6a = 0$

D. None of these

Answer: B

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8. Let $C : y = x^2 - 3, D : y = kx^2$ be two parabolas and $L_1 : x = a, L_2 : x = 1 (a \neq 0)$ be two straight lines.

IF the line L_1 meets the parabola C at a point B on the line L_2, other than A, then a may be equal to

A. $A) - 3$

B. B)-2

C. C) 2

D. D) None of these

Answer: B

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9. Let $C: y = x^2 - 3$, $D: y = kx^2$ be two parabolas and $L_1: x = a$, $L_2: x = 1 (a \neq 0)$ be two straight lines.

If $a > 0$, the angle subtended by the chord AB at the vertex of the parabola C is

A. A) $\tan^{-1}\left(\frac{5}{7}\right)$

B. B) $\tan^{-1}\left(\frac{5}{2}\right)$

C. C) $\tan^{-1}\left[\frac{1}{2}\right]$

D. D)$\tan^{-1}\left(\frac{1}{8}\right)$

Answer: B

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10. Let $P_1 : y^2 = 4ax$ and $P_2 : y^2 = -4ax$ be two parabolas and L : y = x be a straight line.

Equation of the tangent at the point on the parabola P_1 where the line L meets the parabola is

A. $\frac{x^2}{4} + \frac{y^2}{3} = 1$

B. $\frac{x^2}{3} + \frac{y^2}{4} = 1$

C. $\frac{x^2}{16} + \frac{y^2}{12} = 1$

D. $\frac{x^2}{12} + \frac{y^2}{16} = 1$

Answer: C

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11. Let $P_1 : y^2 = 4ax$ and $P_2 : y^2 = -4ax$ be two parabolas and L : y = x be a straight line.

Equation of the tangent at the point on the parabola P_1 where the line L meets the parabola is

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

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

C. $x + 2y - 8a = 0$

D. $x - 2y + 8a = 0$

Answer: A

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12. Let $P_1 : y^2 = 4ax$ and $P_2 : y^2 = -4ax$ be two parabolas and L : y = x be a straight line.

The co-ordinates of the other extremity of a focal chord of the parabola P_2 one of whose extermity is the point of intersection of L and P_2 is

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

B. (b)$\left(-\frac{a}{4}, a\right)$

C. (c)$\left(-\frac{a}{4}, -a\right)$

D. (d)$(-a, -2a)$

Answer: B

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13. Let $C: x^2 + y^2 = 9$, $E: \frac{x^2}{9} + \frac{y^2}{4} = 1$ and L : y = 2x be three curves P be a point on C and PL be the perpendicular to the major axis of ellipse E. PL cuts the ellipse at point M. If equation of normal to C at point P be $L: y = 2x$ then the equation of the tangent at M to the ellipse E is

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

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

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

D. 1

Answer: B

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14. Let $C: x^2 + y^2 = 9$, $E: \frac{x^2}{9} + \frac{y^2}{4} = 1$ and L : y = 2x be three curves P be a point on C and PL be the perpendicular to the major axis of ellipse E. PL cuts the ellipse at point M. If equation of normal to C at point P be $L: y = 2x$ then the equation of the tangent at M to the ellipse E is

A. $x + 3y \pm 3\sqrt{5} = 0$

B. $4x + 3y \pm \sqrt{5} = 0$

C. $x + y \pm 3 = 0$

D. None of these

Answer: A

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15. Let $C: x^2 + y^2 = 9$, $E: \frac{x^2}{9} + \frac{y^2}{4} = 1$ and L : y = 2x be three curves. IF R is the point of intersection of the line L with the line `x =1 , then

A. (a)R lies inside both C and E

B. (b)R lies outside both C and E

C. (c)R lies on both C and E

D. (d)R lies inside C but outside E

Answer: D

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16. An ellipse has its centre $C(1, 3)$ focus at S(6, 3) and passing through the point $P(4, 7)$ then

The product of the lengths of perpendicular segments from the focii on tangent at point P is

A. 20

B. 45

C. 40

D. Cannot be determined

Answer: A

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17. An ellipse E has its center C(3,1), focus at (3,6) and passing through the point P(7,4) Q. The product of the lengths of the prependicular segeent from the focii on tangent at point P is

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

B. $\left(\frac{4}{3}, 3\right)$

C. $\left(\frac{8}{3}, 3\right)$

D. $\left(\frac{10}{3}, 5\right)$

Answer: D

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18. An ellipse has its centre $C(1, 3)$ focus at S(6, 3) and passing through the point $P(4, 7)$ then

If the normal at a variable point on the ellipse meets its axes in Q and R then the locus of the mid-point of QR is a conic with an eccentricity (e') then

A. $e = \frac{3}{\sqrt{10}}$

B. $e' = \frac{\sqrt{5}}{3}$

C. $e' = \frac{3}{\sqrt{5}}$

D. $e' = \frac{\sqrt{10}}{3}$

Answer: B

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19. Let $H: x^2 - y^2 = 9, P: y^2 = 4(x-5), L: x = 9$ be three curves. If L is the chord of contact of the hyperbola

H, then the equation of the corresponding pair of tangent is

A. (A)$9x^2 - 8y^2 + 18x + 9 = 0$

B. (B)$9x^2 - 8y^2 - 18x - 9 = 0$

C. (C)$9x^2 - 8y^2 - 18x + 9 = 0$

D. (D)$9x^2 + 8y^2 + 18x + 9 = 0$

Answer: A

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20. Let $H: x^2 - y^2 = 9, P: y^2 = 4(x - 5), L: x = 9$ be three curves.

If L is the chord of contact of the hyperbola H, then the equation of the corresponding pair of tangent is

A. x = 7

B. x = 9

C. $y = 7$

D. $y = 9$

Answer: B

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21. Let $H : x^2 - y^2 = 9, P : y^2 = 4(x - 5), L : x = 9$ be three curves.

IF the chord of contact of R with repect to the parabola P meets the parabola at T and T'. S is the focus of the parabola then the area of the $\triangle \mathrm{STT}'$ is sq. units

A. 8

B. 9

C. 12

D. 16

Answer: C

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22. Rectangular hyperbola is the hyperbola whose asymptotes are perpendicular hence its equationis $x^2 - y^2 = a^2$, if axes are rotated by 45° in clockwise

direction then its equation becomes $xy = c^2$.

Focus of hyperbola $xy = 16$, is

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

B. $(4\sqrt{2}, 0)$

C. $(0, 4\sqrt{2})$

D. $(4, 0)$

Answer: A

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23. Rectangular hyperbola is the hyperbola whose asymptotes are perpendicular hence its equationis $x^2 - y^2 = a^2$, if axes are rotated by 45° in clockwise

direction then its equation becomes $xy = c^2$.

Directrix of hyperbola xy = 16 are

A. $x + y = 4\sqrt{2}$

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

C. $x + y = 4$

D. $x + y = -4$

Answer: A

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24. Rectangular hyperbola is the hyperbola whose asymptotes are perpendicular hence its equationis $x^2 - y^2 = a^2$, if axes are rotated by 45° in clockwise

direction then its equation becomes $xy = c^2$.

Length of minor axis of hyperbola $xy = 16$ is

A. $4\sqrt{2}$

B. 4

C. $8\sqrt{2}$

D. 8

Answer: C

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SECTION -E (Assertion-Reason Type Questions)

1. STATEMENT-1 : The equation of chord of circle $x^2+y^2-6x+10y-9=0$, which is be bisected at $(-2, 4)$ must be x + y = 2.

and

STATEMENT-2 : The equation of chord with mid-point (x_1, y_1) to the circle $x^2+y^2=r^2$ is $\times_1 + yy_1 = x_1^2 + y^2$.

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 False, Statement-2 is true

Answer: D

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2. STATEMENT -1 : The farthest point on the circle $x^2 + y^2 - 2x - 4y + 4$ from (0, 0) is (1, 3).

and

STATEMENT-2 : The farthest and nearest points on a circle from a given point are the end points of the diameter through the point.

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 False, Statement-2 is true

Answer: D

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3. STATEMENT-1 : The agnle between the tangents drawn from the point (6, 8) to the circle $x^2 + y^2 = 50$ is 90°.

and

STATEMENT-2 : The locus of point of intersection of perpendicular tangents to the circle $x^2 + y^2 = r^2$ is $x^2 + y^2 = 2r^2$.

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 False, Statement-2 is true

Answer: A

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4. STATEMENT-1 : Let $x^2 + y^2 = a^2$ and $x^2 + y^2 - 6x - 8y - 11 = 0$ be two circles. If a = 5 then two common tangents are possible.

and

STATEMENT-2 : If two circles are intersecting then they have two common tangents.

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 False, Statement-2 is true

Answer: A

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5. STATEMENT-1 : If n circles $(n \geq 3)$, no two circles are non-centric and no three centre are collinear and number of radical centre is equal to number of radical axes, then n = 5.

and

STATEMENT-2 : If no three centres are collinear and no two circles are concentric, then number of radical centre is ${}^{n}C_{3}$ and number of radical axs is ${}^{n}C_{2}$.

A. (a) Statement-1 is true, statement-2 is true, Statement -2 is a correct explanation for Statement

-1

B. (b)Statement -1 is true, Statement-2 is true , Statement-2 is NOT a correct explanation for statement-1

C. (c)Statement-1 is true, Statement-2 is False

D. (d)Statement-1 is False, Statement-2 is true

Answer: A

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6. STATEMENT -1 : if O is the origin and OP and OQ are tangents to the circle $x^2 + y^2 + 2x + 4y + 1 = 0$ the circumcentre of the triangle is $\left(\frac{-1}{2}, -1\right)$.

and

STATEMENT-2 : $OP.\ OQ = PQ^2$.

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 False, Statement-2 is true

Answer: C

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7. STATEMENT-1 : From point (4, 0) three different normals can be drawn to the parabola $y^2 = 4x$.

and

STATEMENT-2 : From any point, atmost three different normals can be drawn to a hyperbola.

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 False, Statement-2 is true

Answer: B

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8. Normals of parabola $y^2 = 4x$ at P and Q meets at $R(x_2, 0)$ and tangents at P and Q meets at $T(x_1, 0)$. If $x_2 = 3$, then find the area of quadrilateral PTQR.

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 False, Statement-2 is true

Answer: C

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9. **Statement I:** The lines from the vertex to the two extremities of a focal chord of the parabola $y^2 = 4ax$ are perpendicular to each other.

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

A. 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 False, Statement-2 is true

Answer: D

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10. STATEMENT-1 : The length of latus rectum of the parabola $(x-y+2)^2 = 8\sqrt{2}\{x+y-6\}$ is $8\sqrt{2}$.

and

STATEMENT-2 : The length of latus rectum of parabola $(y-a)^2 = 8\sqrt{2}(x-b)$ is $8\sqrt{2}$.

A. (a)Statement-1 is true, statement-2 is true, Statement -2 is a correct explanation for Statement -1

B. (b)Statement -1 is true, Statement-2 is true , Statement-2 is NOT a correct explanation for statement-1

C. (c)Statement-1 is true, Statement-2 is False

D. (d)Statement-1 is False, Statement-2 is true

Answer: C

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11. Let $S_1 : x^2 + y^2 = 25$ and $S_2 : x^2 + y^2 - 2x - 2y - 14 = 0$ be two circles.

STATEMENT-1 : S_1 and S_2 have exactly two common tangents.

and

STATEMENT-2 : If two circles touches each other internally they have one common tangent.

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 False, Statement-2 is true

Answer: B

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12. Statement-1 : if P and D be the ends of conjugate diameters then the locus of mid-point of PD is a circle.

and

STATEMENT-2 : if P and D be the ends of conjugate diameter, then the locus of intersection of tangents at P and D is an ellipse.

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 False, Statement-2 is true

Answer: D

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13. STATEMENT-1 : The line $y=\frac{b}{a}x$ will not meet the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1,(a>b>0)$.

and

STATEMENT-2 : The line $y=\frac{b}{a}x$ is an asymptote to the hyperbola.

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 False, Statement-2 is true

Answer: A

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14. Statement 1: Lines $3x - 4y + 7 = 0$ and $4x + 3y + 8 = 0$ are the asymptotes of a rectangular hyperbola.

Statement 2: In a rectangular hyperbola, asymptotes intersect at a right angle.

A. (a) Statement 1 and Statement 2 are true and Statement 2 is the correct explanation for Statement 1

B. (b) Statement 1 and Statement 2 are true but Statement 2 is not the correct explanation for Statement 1

C. (c) Statement 1 is true but Statement 2 is false

D. (d) Statement 2 is true but Statement 1 is false

Answer: A

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15. Statement-I A hyperbola and its conjugate hyperbola have the same asymptotes.

Statement-II The difference between the second degree curve and pair of asymptotes is constant.

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 False, Statement-2 is true

Answer: A

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16. STATEMENT-1 : The line $3x + 4y = 5$ intersects the hyperbola $9x^2 - 16y^2 = 144$ only at one point.

and

STATEMENT-2 : Given line is parallel to an asymptotes of the hyperbola.

A. (A)Statement-1 is true, statement-2 is true, Statement -2 is a correct explanation for Statement -1

B. (B)Statement -1 is true, Statement-2 is true , Statement-2 is NOT a correct explanation for statement-1

C. (C)Statement-1 is true, Statement-2 is False

D. (D)Statement-1 is False, Statement-2 is true

Answer: A

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17. STATEMENT-1 : If lines $y = m_1 x$ and $y = m_2 x$ are the conjugate diameter of the hyperbola $xy = c^2$ then $m_1 + m_2 = 0.$

and

STATEMENT-2 : Two lines are called conjugate diameter of hyperbola if they bisect the chords parallel to 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-1

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

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

Answer: A

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18. STATEMENT-1 : Tangent at any point $P(x_1, y_1)$ on the hyperbola$xy = c^2$ meets the co-ordinate axes at points Q and R, the circumcentre of $\triangle OQR$ has co-ordinate $(x_1 y_1)$.

and

STATEMENT-2 : Equation of tangent at point $(x_1 y_1)$ to the curve $xy = c^2$ is $\frac{x}{x_1} + \frac{y}{y_1} = 2.$

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 False, Statement-2 is true

Answer: B

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SECTION -F (Matrix-Match Type Questions)

1. $x^2 + y^2 - 14x - 10y + 24 = 0$ makes an

Column-I		Column-II
(A) Intercept on x-axis of length	(p)	0
(B) Intercept on y-axis of length	(q)	2
(C) Intercept on $y = x$ of length	(r)	$8\sqrt{3}$
(D) Intercept on $7x + y - 4 = 0$ of length	(s)	10

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2. Match column I to column II according to given conditions.

Column-I		Column-II
(A) Length of common tangents of $x^2 + y^2 = 1$ and $x^2 + y^2 - 10x + 21 = 0$ is	(p)	$2\sqrt{6}$
(B) Length of common tangents of $x^2 + y^2 = 1$ and $x^2 + y^2 - 4x + 3 = 0$ is	(q)	4
(C) Length of common tangents of $x^2 + y^2 = 1$ and $x^2 + y^2 - 2x - 3 = 0$ is always less than	(r)	2
(D) Length of common tangents of $x^2 + y^2 = 1$ and $x^2 + y^2 - 2x = 0$ is always less than	(s)	0
	(t)	1

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3. Match column I to column II according to given conditions.

Column-I	Column-II
(A) The area of triangle formed by the tangents and the chord of contact drawn from (2, 3) to the circle $x^2 + y^2 = 1$, is	(p) $\frac{12\sqrt{12}}{13}$
(B) The distance of (0, 0) from the circle $x^2 + y^2 - 10x + 24 = 0$ is	(q) 4
(C) The radius of smallest circle passing through (4, 0) and (0, 4) is	(r) 6
(D) The maximum number of normals of a circle passing through the centre is always greater than	(s) $2\sqrt{2}$
	(t) 1

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4. Mathch the following columns

Column-I	Column-II
(A) A circle is inscribed in an equilateral triangle of side a, then the area of any square inscribed in the circle is	(p) $\frac{a^2}{6}$
(B) The equation of circle $x^2 + y^2 = 4a^2$ with origin as centre, passing through the vertices of an equilateral triangle whose median is of length	(q) a
(C) If a chord of the circle $x^2 + y^2 = \frac{9a^2}{2}$ makes equal intercept of length k on the co-ordinate axes then the value of k can be	(r) $2a$
(D) If the line $hx + ky = 1$ touches $x^2 + y^2 = \frac{1}{4a^2}$, then the locus of the point (h, k) is a circle of radius	(s) $3a$

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6. Match column I to column II according to the given condition.

Column-I		Column-II
(A) Tangents at the ends of focal chord for a parabola	(p)	Meet at directrix
(B) Let P is a point on the parabola and tangent at P meets the directrix at Q. If S is the focus of parabola then SP and SQ	(q)	Meet at an angle of 90°
(C) If $A(at_1^2, 2at_1)$ and $B(at_2^2, 2at_2)$ are the ends of a focal chord of $y^2 = 4ax$ then	(r)	$t_1 t_2 = -1$
(D) If the normal at $(at_1^2, 2at_1)$ meets the parabola $y^2 = 4ax$ again at $(at_2^2, 2at_2)$ then	(s)	$t_2 = -t_1 - \frac{2}{t_1}$
	(t)	$t_1 t_2 + t_1^2 + 2 = 0$

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7. consider the ellipse $x^2 + 2y^2 - 4x - 4y + 4 = 0$ and match column I to column II according to the given condition.

Column-I		Column-II
(A) The eccentricity of the ellipse is	(p)	$\frac{1}{\sqrt{2}}$
(B) The length of latus rectum	(q)	$\sqrt{2}$
(C) The area of parallelogram formed by the tangents at the end of conjugate diameters is always greater than	(r)	4
(D) The sum of squares of two semi-conjugate diameters is greater than	(s)	$2\sqrt{2}$
	(t)	2

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8. Match the following

Column-I	Column-II
(A) Product of the perpendicular from foci of any tangent to the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ is	(p) $x=\pm\frac{16}{\sqrt{7}}$
(B) The equation $\frac{x^2}{3-a}+\frac{y^2}{2-a}=1$ represents an ellipse, then the value of a is	(q) $(-\infty, 2)$
(C) The common tangent of $x^2+y^2=4$ and $x^2+2y^2=2$ is	(r) 4
(D) Polar of the focus to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ is	(s) Not defined
	(t) $2x-3y+4=0$

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9. Match the following

Column-I	Column-II
(A) Vertex of the parabola $y^2+6x-2y+13=0$	(p) $(5, 3)$
(B) Centre of the ellipse $25x^2+9y^2-250x-54y+481=0$	(q) $(1, -1)$
(C) Focus of the parabola $(y+1)^2=12(x+2)$	(r) $(-2, 1)$
(D) End of latus rectum of the hyperbola $\frac{x^2}{9}-\frac{y^2}{1}=1$	(s) $\left(\sqrt{10}, \frac{1}{3}\right)$

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SECTION-G (Integer Answer Type Questions)

1. Tangents drawn from the point $P(1, 8)$ to the circle $x^2 + y^2 - 6x - 4y - 11 = 0$ touch the circle at points A and B. The equation of the cricumcircle of triangle PAB is

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2. If the centre of a circle is $(3, 4)$ and its size is just sufficient to contain to circle $x^2 + y^2 = 1$, then the radius of the required circle is ____.

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3. There are two perpendicular lines, one touches to the circle $x^2 + y^2 = r_1^2$ and other touches to the circle $x^2 + y^2 = r_2^2$ if the locus of the point of intersection of these tangents is $x^2 + y^2 = 9$, then the value of $r_1^2 + r_2^2$ is.

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4. Suppose the equation of circle is $x^2 + y^2 - 8x - 6y + 24 = 0$ and let (p, q) is any point on the circle, Then the no. of possible integral values of $|p + q|$ is

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5. Let the equation of the circle is $x^2 + y^2 = 4$. Find the total number of points on $y = |x|$ from which perpendicular tangents can be drawn.

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6. Let the equation of the circle is $x^2 + y^2 - 2x - 4y + 1 = 0$ A line through $P(\alpha, -1)$ is drawn which intersect the given circle at the point A and B. if PA PB has the minimum value then the value of α is.

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7. Let the equation of the circle is $x^2 + y^2 = 25$ and the equation of the line $x + y = 8$. If the radius of the circle of minimum area and also touches $x + y = 8$ and $x^2 + y^2 = 25$ is $\frac{4\sqrt{2} - 5}{\lambda}$. Then the value of λ is.

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8. If the loucus of the feet of perpendicular from the foci on any tangent to an ellipse $\frac{x^2}{4} + \frac{y^2}{2} = 1$ is $x^2 + y^2 = k$, then the value of k is ______.

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9. The number of points on the ellipse $\frac{x^2}{50}+\frac{y^2}{20}=1$ from which a pair of perpendicular tangents is drawn to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ is 0 (b) 2 (c) 1 (d) 4

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10. If any two chords be drawn through two points on major axis of an ellipse equidistant from centre, then $\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)\tan\left(\frac{\gamma}{2}\right)\tan\left(\frac{\delta}{2}\right)$ = _____,

(where $\alpha, \beta, \gamma, \delta$ are ecentric angles of extremities of chords)

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11. An elllipse intersects the hyperbola $2x^2 - 2y^2 = 1$ orthogonally. The eccentricity of the ellipse is reciprocal of that of the hyperbola. If the axes of the ellipse are along the coordinate axes and the equation of the ellipse is $x^2 + ky^2 = k$ then the value of k is _____ .

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12. The equation of directrix of a hyperbola is $3x + 4y + 8 = 0$ The focus of the hyperbola is $(1, 1)$. If eccentricity of the hyperbola is 2 and the length of conjugate axis is k then [k], where [] represents the greatest integer function, is equal to _______ .

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SECTION - H (Multiple True-False Type Questions)

1. STATEMENT-1 : The area of equilateral triangle inscribed in the circle $x^2+y^2+6x+8y+24=0$ is $\frac{3\sqrt{3}}{4}$.

STATEMENT-2 : The abscissae of two points A and B are the roots of the equation $x^2+3ax+b^2=0$ and their ordinates are the roots of $x^2+3bx+a^2=0$ Then the equation of the circle with AB as diameter is $x^2+y^2+3ax+3by+a^2+b^2=0$.

STATEMENT-3 : If the circle $x^2+y^2+2gx+2fx+c=0$ always passes through exactly three quadrants not passing through origin then $c>0$.

A. T F T

B. T T T

C. F F F

D. F F T

Answer: B

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2. STATEMENT-1 : Tangents from origin to the circle $A(x-2)^2 + y^2 = 1$. Then circle B touching the circle A and tangents have radius $\frac{1}{3}$ units.

STATEMENT-2 : Circle B touching the circle A and tangents have radius 2 units.

STATEMENT-3 : Length of common tangents between circle A and B is $\sqrt{3}$.

A. TTF

B. T F F

C. F F F

D. T T T

Answer: B

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3. STATEMENT-1 : Equation of circle which touches the circle $x^2 + y^2 - 6x + 6y + 17 = 0$ externally and to which the lines $x^2 - 3xy - 3x + 9y = 0$ are normal is $x^2 + y^2 - 6x - 2y + 1 = 0$.

STATEMENT-2 : Equation of circle which touches the circle

$x^2 + y^2 - 6x + 6y + 17 = 0$ internally and to which the line $x^2 - 3xy - 3x + 9y = 0$ are normal is $x^2 + y^2 - 6x - 2y - 15 = 0.$

STATMENT-3 : Equation of circle which is orthogonal to circle $x^2 + y^2 - 6x + 6y + 17 = 0$ and have normals along $x^2 - 3xy - 3x + 9y = 0$ is $x^2 + y^2 - 6x - 2y - 5 = 0.$

A. T T F

B. T F F

C. F F F

D. T T T

Answer: D

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4. STATEMENT-1 :The locus of centroid of a triangle formed by three co-normal points on a parabola is the axis of parabola.

STATEMENT-2 : One of the angles between the parabolas $y^2 = 8x$ and $x^2 = 27y$ is $\tan^{-1}\left(\frac{9}{13}\right)$.

STATEMENT-3 : Consider the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ THe product of lengths of perpendiculars drawn from foci to a tangent is 4.

A. A) T F T

B. B) T T T

C. C) F F F

D. D) F F T

Answer: B

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5. STATEMENT-1 : Let us consider three points A, B, C on a parabola. Tangents at A, B and C form a triangle PQR. If the area of triangle ABC is 10 then the area of trianglePQR is 5.

STATEMENT-2 : IF the foci of an ellipse are (3, 4) and (5, 12) and (0, 0) lies on the ellipse then the length of major axis of the ellipse is 9.

STATMENT-3 : If $k < AB$, where A, B are two fixed point in x-y plane and P is a variable point and $|PA - PB| = k$, the eccentricity of the conic is $\frac{AB}{k}$.

A. T FT

B. T T T

C. F F F

D. F F T

Answer: A

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SECTION -I (Subjective Type Questions)

1. Sum of the squares of the length of the tangents from the points (18, 18), (10, 20) and (21, 21) to the circle $x^2 + y^2 = 25$ is equal to _______ .

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2. If the points (2, 3), (0, 2), (4, 5) and (0, t) are concyclic, then $t^3 + 17$ is equal to ________.

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3. The equation of a tangent to the circle with centre $(2, -1)$ is $3x + y = 0$. Twice of the square of the length of the tangent to the circle from the point $(23, 17)$ is ________ .

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4. A circle passes through the point $(3, 4)$ and cuts the circle $x^2 + y^2 = c^2$ orthogonally, the locus of its centre is a straight line. If the distance of this straight line from the origin is 25. then $a^2 =$

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5. Two circles are inscribed and circumscribed about a square ABCD, length of each side of the square is 32. P and Q are two points repectively on these circles, then $\sigma(PA)^2 + \sigma(QA)^2$ equals ________ .

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6. The square of the length of the tangent drawn from any point on the circle $x^2 + y^2 + 70x - 45y + 6789 = 0$ to the circle $x^2 + y^2 + 70x - 45y + 9876 = 0$ is _____ .

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7. l and m are the lengths of the tangents from the origin and the point $(9, -1)$ to the circle $x^2 + y^2 + 18x - 2y + 32 = 0$. The value of $17(l^2 + m^2)$ is equal to _______ .

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8. The least distance between two points P and Q on the circle $x^2 + y^2 - 8x + 10y + 37 = 0$ and $x^2 + y^2 + 16x + 55 = 0$ is ______ .

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9. The sum of the square of the length of the chord intercepted by the line n+y=n, $n \in N$ on the circle $x^2 + y^2 = 4$ is

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10. The area of the region bounded by the curves $\{(x, y) : x^2 + y^2 \leq 4, 2 \leq x + y\}$ is ________ .

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11. The chord of contact of tangents from 3 points A, B, C to the circle $x^2 + y^2 = 4$ are concurrent, then the points A, B and C are:

A. a) concyclic

B. b) collinear

C. c) form the vertices of a triangle

D. d) none of these

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12. Let x, y be real variable satisfying $x^2 + y^2 + 8x - 10y - 59 = 0$ Let $a = \max\left\{(x-3)^2 + (y-4)^2\right.$ and $b = \min\left\{(x-3)^2 + (y-4)^2\right)$, then a + b + 2010 is ______ .

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13. If the tangent at P to the parabola $y^2 = 7x$ is parallel to 6y -x + 11 =0` then square of the distance of P from the vertex of the parabola is ______ .

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

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15. The mirror image of the parabola $y^2 = 4x$ in the tangent to the parabola at the point (1,2) is

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16. Locus of the point of intersection of the tangents to $\frac{x^2}{(73)^2} + \frac{y^2}{(14)^2} = 1$ which intersect at right angles is a circle with centre (0, 0) and radius r, then r^2 equals

________ .

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17. Find the equation of the circle passing through the points of intersection of the ellipses $\frac{x^2}{16}+\frac{y^2}{9}=1$ and $\frac{x^2}{9}+\frac{y^2}{16}=1.$

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18. find the equation of parabola which is symmetric about y-axis,and passes through point (2,-3).

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19. Find the point on the curve $3x^2 - 4y^2 = 72$ which is nearest to the line $3x + 2y + 1 = 0.$

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20. The line passing through the extremity A of the major exis and extremity B of the minor axis of the ellipse $x^2 + 9y^2 = 9$ meets is auxiliary circle at the point $M.$ Then the area of the triangle with vertices at $A, M,$ and O (the origin) is (a) 31/10 (b) 29/10 (c) 21/10 (d) 27/10

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21. If the tangents and normal to an ellipse $9x^2 + 16y^2 = 144$ at a point intercept a_1, a_2 on x-axis and b_1, b_2 on y-axis. Then the value of $a_1a_2 + b_1b_2 + 1000$ is ________ .

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

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23. Let PN be the ordinate of a point P on the hyperbola $\frac{x^2}{(97)^2} - \frac{y^2}{(97)^2} = 1$ and the tangent at P meets the transverse axis in T, O is the origin, then $\left[\frac{ON.\,OT}{2010}\right] = - - - - - - - - - - - - ,$ where [.] denotes the greatest integer function.

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24. Let C be a curve which is the locus of the point of intersection of lines $x = 2 + m$ and $my = 4 - m\cdot$ A circle $s \equiv (x-2)^2 + (y+1)^2 = 25$ intersects the curve C at four points: $P, Q, R, andS$. If O is center of the curve C, then $OP^2 + OP^2 + OR^2 + OS^2$ is (a) 50 (b) 100 (c) 25 (d) $\frac{25}{2}$

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SECTION - J (Aakash Challengers Questions)

1. Find the angle between the two tangents from the origin to the circle $(x-7)^2+(y+1)^2=25$

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2. The area of the triangle formed by the tangent at $(3, 4)$ to the circle $x^2+y^2=25$ and the co-ordinate axes is ____

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3. If P_1, P_2, P_3 are the perimeters of the three circles,

$S_1 : x^2 + y^2 + 8x - 6y = 0$

$S_2 : 4x^2 + 4y^2 - 4x - 12y - 186 = 0$ and

$S_3 : x^2 + y^2 - 6x + 6y - 9 = 0$ respectively, then the relation amongst P_1, P_2 and P_3 is ....

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4. If $(1, a), (b, 2)$ are conjugate points with repect to the circle $x^2 + y^2 = 25$, then the value of $4a + 2b + 2010$ is

....

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5. Area of the equilateral $\triangle$ inscribed in the circle $x^2 + y^2 - 7x + 9y + 5 = 0$, is ....

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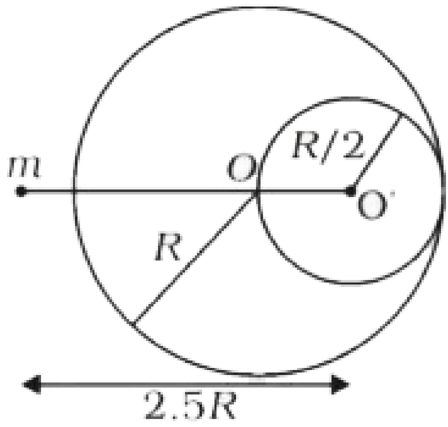
6. A solid sphere of radius R/2 is cut out of a solid sphere of radius R such that the spherical cavity so formed touches the surface on one side and the centre of the sphere on the other side, as shown. The initial mass of the solid sphere was M. If a particle of mass m is placed at a distance 2.5R from the centre of the cavity, then what is the gravitational attraction on the mass m?



A. $\dfrac{1}{\sqrt{6}} = \dfrac{1}{\sqrt{c}} + \dfrac{1}{\sqrt{b}}$

B. $\dfrac{1}{\sqrt{b}} = \dfrac{1}{\sqrt{c}} + \dfrac{1}{\sqrt{a}}$

C. $\dfrac{1}{\sqrt{c}} = \dfrac{1}{\sqrt{a}} + \dfrac{1}{\sqrt{b}}$

D. $c = (ab)^{\frac{1}{2}}$

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7. The range of parameter $'a'$ for which the variable line $y = 2x + a$ lies between the circles $x^2 + y^2 - 2x - 2y + 1 = 0$ and $x^2 + y^2 - 16x - 2y + 61 = 0$ without intersecting or touching either circle is (a)$a \in \left(2\sqrt{5} - 15, 0\right)$ (b) $a \in \left(-\infty, 2\sqrt{5} - 15,\right)$ (c)$a \in \left(2\sqrt{5} - 15, -\sqrt{5} - 1\right)$

(d) $a \in \left(-\sqrt{5} - 1, \infty\right)$

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8. A planet of mass m moves along an ellipse around the sun (mass M) so that its maxima and minimum distances from the sun are equal to r_1 and r_2 respectively. The angular momentum of this plane relative to the centre of the sun is $m\sqrt{\frac{PGMr_1r_2}{8(r_1 + r_2)}}$

A. 1 sq. units

B. 2 sq. units

C. $\frac{160}{17}$ sq. units

D. 4 sq. units

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9. There are exactly two points on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$,whose distance from its centre is same and equal to $\sqrt{\frac{a^2 + 2b^2}{2}}$. The eccentricity of the ellipse is: (A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{\sqrt{2}}{3}$ (D) $\frac{\sqrt{3}}{2}$

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

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

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

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

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10. The line$2px + y\sqrt{1-p^2} = 1(|p| < 1)$ for different values of p, touches a fixed ellipse whose exes are the coordinate axes. Q. The foci of the ellipse are

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11. A point P moves such that the sum of the slopes of the normals drawn from it to the hyperbola $xy = 16$ is equal to the sum of ordinates of feet of normals . The locus of P is a curve C.

The equation of the curve C is

A. Point

B. Straight line

C. Circle

D. Parabola

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12. A rectangular hyperbola whose centre is C is cut by any circle of radius r in four points P, Q, R and S. Then, $CP^2 + CQ^2 + CR^2 + CS^2 =$ (A) r^2 (B) $2r^2$ (C) $3r^2$ (D) $4r^2$

A. r^2

B. $2r^2$

C. $3r^2$

D. $4r^2$

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13. Let P be a point on the hyperbola $x^2 - y^2 = a^2$, where a is a parameter, such that P is nearest to the line $y = 2x$. Find the locus of P..

A. $y = 2x$

B. $2y = x$

C. $y = x$

D. $y + x = 0$

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14. Tangents are drawn from the points on a tangent of the hyperbola $x^2 - y^2 = a^2$ to the parabola $y^2 = 4ax$. If all the chords of contact pass through a fixed point Q, prove that the locus of the point Q for different tangents on the hyperbola is an ellipse.

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15. A tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ cuts the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at $PandQ$. Show that the locus of the midpoint of PQ is $\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right)^2 = \frac{x^2}{a^2} - \frac{y^2}{b^2}$.

A. $\left(\frac{x^2}{a^2}\right)^2 + \left(\frac{y^2}{b^2}\right)^2 = 1$

B. $\left(\frac{x^2}{a^2}\right)^2 - \left(\frac{y^2}{b^2}\right)^2 = 1$

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

D. $\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right) = \left(\frac{x^2}{a^2} - \frac{y^2}{b^2}\right)^2$

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16. Let $F(x) = (1 + b^2)x^2 + 2bx + 1$. The minimum value of F(x) is the reciprocal of the square of the eccentricity of the hyperbola $\frac{x^2}{16} + \frac{y^2}{9} = 1$. Then the equation of the common tangents to the curves $\frac{x^2}{16} + \frac{y^2}{9/16} = 1$ and $x^2 + y^2 = b^2$ is

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