MATHS

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MATHS (HINGLISH)

ELLIPSE

Illustration

1. Find the length of the latus rectum of the ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$

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2. Find the centre, foci , the length of the axis, eccentricity and the equation of the directrices of the ellipse . $9x^2 + 16y^2 - 18x + 32y - 119 = 0$

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3. Find the equation of the ellipse whose eccentricity is $\frac{1}{2}$, a focus is (2,3) and a directrix is x=7. Find the length of the major and minor axes of the ellipse .

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4. Find an equation of the tangent to the ellipse $\frac{x^2}{81} + \frac{y^2}{49} = 1$ at the point P whose eccentric angle is $\pi/6$. Also find the coordinates of P .

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5. $5\sqrt{3}x + 7y = 70$ is a tangent to the ellipse $\frac{x^2}{49} + \frac{y^2}{25} = 1$ at the point P. Find the coordinates of P and the equation of the normal at P .

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6. If y=mx+5 is a tangent to the ellipse $4x^2 + 25y^2 = 100$, then find the value of $100m^2$.

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7. Find the equation of the chord of contact of the point (3,1) to the ellipse $x^2 + 9y^2 = 9$. Also find the mid-point of this chord of contact.

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8. Find the equation of the ellipse whose auxilliary circle is the director circle of the ellipse

$\frac{x^2}{36} + \frac{y^2}{13} = 1$ and the length of a latus rectum is 2 units.

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9. Find the equation of the directrices of the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$

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Solved Examples Single Correct Answer

1. Equation of a directrix of the ellipse $\frac{x^2}{36}+\frac{y^2}{4}=1$ is

A. 9x-8=0

B. 8x-9=0

C. $\sqrt{2}x+9=0$

D. $x+9\sqrt{2}=0$

Answer: C

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2. The locus of a point whose distance from the point (3,0) is 3/5 times its distance from the line x=p is an ellipse with centre at the origin. The value of p is

A. 5

B. 7

C. $\frac{25}{3}$

D. $\frac{25}{9}$

Answer: C

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3. An equation of the ellipse whose length of the major axis is 10 and foci are ($\pm$ 2, 0)is

A. $\frac{x^2}{25}+\frac{y^2}{21}=1$

B. $\frac{x^2}{25}+\frac{y^2}{4}=1$

C. $\frac{x^2}{25}+\frac{y^2}{16}=1$

D. $\frac{x^2}{29}+\frac{y^2}{25}=1$

Answer: A

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4. If $P = (x, y), F_1 = (3, 0), F_2 = (-3, 0),$ and $16x^2 + 25y^2 = 400$, then $PF_1 + PF_2$ equal 8 (b) 6 (c) 10 (d) 12

A. 8

B. 6

C. 10

D. 12

Answer: C

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5. Equation of a common tangent to the circle $x^2 + y^2 = 16$, parabola $x^2 = y - 4$ and the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 0$ is

A. x=4

B. x=-4

C. y=4

D. y=5

Answer: C

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6. If y = x + c is a normal to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, then c^2 is equal to

A. $\frac{13}{25}$

B. $\frac{25}{13}$

C. $\frac{25}{9}$

D. $\frac{13}{4}$

Answer: B

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7. If F_1(-3, 4) and F_2 (2, 5) are the foci of an ellipse passing through the origin, then the eccentricity of the ellipse is

A. $\frac{\sqrt{29}}{5+\sqrt{29}}$

B. $\frac{\sqrt{21}}{5+\sqrt{29}}$

C. $\frac{\sqrt{26}}{5+\sqrt{29}}$

D. $\frac{\sqrt{29}}{5+\sqrt{21}}$

Answer: C

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8. $E_1 : \frac{x^2}{81} + \frac{y^2}{b^2} = 1$ and $E_2 : \frac{x^2}{b^2} + \frac{y^2}{49} = 1$ two ellipses having the same eccentricity if b^2 is equal to

A. 32

B. 63

C. 65

D. 64

Answer: B

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9. If the normal at any point P on the ellipse $\frac{x^2}{64} + \frac{y^2}{36} = 1$ meets the major axis at G_1 and the minor axis at G_2 then the ratio of PG_1 and PG_2 is equal to

A. $6:8$

B. $8:6$

C. $9:16$

D. $16:9$

Answer: C

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10. The tangent at the point P $\left(\frac{4}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right)$ to the ellipse $9x^2 + 16y^2 = 144$ meets the axis of x at A and the axis of y at B. If C is the centre of the ellipse, then area of the $\triangle ABC$ is (in sq. units)

A. 12

B. 16

C. 9

D. 24

Answer: A

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11. A point on the ellipse, $4x^2 + 9y^2 = 36$, where the normal is parallel to the line, $4x - 2y - 5 = 0$ is (A) $\left(\frac{8}{5}, -\frac{9}{5}\right)$ (B) $\left(-\frac{9}{5}, \frac{8}{5}\right)$ (C) $\left(\frac{8}{5}, \frac{9}{5}\right)$ (D) $\left(\frac{9}{5}, \frac{8}{5}\right)$

A. $\left(\frac{9}{5}, \frac{8}{5}\right)$

B. $\left(\frac{8}{5}, \frac{9}{5}\right)$

C. $\left(-\frac{9}{5}, \frac{8}{5}\right)$

D. $\left(\frac{8}{5}, \frac{9}{5}\right)$

Answer: A

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12. The equation of the parabola whose vertex is at the centre of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ and the focus coincide with the focus of the ellipse on the positive side of the major axis of the ellipse is

A. $y^2 = 3x$

B. $y^2 = 4x$

C. $y^2 = 5x$

D. $y^2 = 12x$

Answer: D

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13. Consider the ellipses $E_1 : \frac{x^2}{9} + \frac{y^2}{5} = 1$ and $E_2 : \frac{x^2}{5} + \frac{y^2}{9} = 1$. Both the ellipses have

A. the same foci

B. same major axis

C. the same minor axis

D. the same eccentricity

Answer: D

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14. If the area of the ellipse $\left(\frac{x^2}{a^2}\right)+\left(\frac{y^2}{b^2}\right)=1$ is 4π , then find the maximum area of rectangle inscribed in the ellipse.

A. 4

B. 8

C. 16

D. 32

Answer: B

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15. Equation of a circle described on the Latus rectum of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ as a diameter with centre on the +ve x-axis is

A. $25x^2 + 25y^2 - 150y - 31 = 0$

B. $25x^2 + 25y^2 - 150x + 31 = 0$

C. $25x^2 + 25y^2 - 150x - 31 = 0$

D. $25x^2 + 25y^2 - 150y + 31 = 0$

Answer: C

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Solved Examples Level 1 Single Correct Answer

1. The eccentricity of an ellipse with its centre at the origin is $\frac{1}{2}$. If one of the directrices is x = 4 , then the equation of ellipse is

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

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

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

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

Answer: B

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2. In an ellipse, the distances between its foci is 6 and minor axis is 8. Then its eccentricity is

A. $1/\sqrt{5}$

B. $3/5$

C. $1/2$

D. $4/5$

Answer: B

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3. the locus of the point of intersection of tangents to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ which meet at right , is

A. a circle

B. a parabola

C. an ellipse

D. a hyperbola

Answer: A

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4. The normal at an end of a latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ passes through an end of the minor axis if

A. $e^4 + e^2 = 1$

B. $e^3 + e^2 = 1$

C. $e^2 + e = 1$

D. $e^3 + e = 1$

Answer: A

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5. The locus of the middle points of the portions of the tangents of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ included between the axis is the curve

(a) $\frac{x^2}{a^2}+\frac{y^2}{b^2}=\frac{1}{4}$

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

(c) $a^2x^2+b^2y^2=4$

(d) $b^2x^2+a^2y^2=4$

A. $x^2/a^2+y^2/b^2=4$

B. $a^2/x^2+b^2/y^2=4$

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

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

Answer: B

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6. In a model, it is shown that an arc of a bridge in semi-elliptical with major axis horizontal. If the length of the base is 9 m and the highest part of the bridge is 3 m from the horizontal, the best approximation of the height of the arch at 2 m from the centre of the base is

A. 11/4 m

B. 8/3 m

C. 7/2 m

D. 2 m

Answer: B

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7. 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. a circle

B. an ellipse

C. a hyperbola

D. none of these

Answer: D

8. Theorem:-The sum of the focal diatances of any point on an ellipse is constant and equal to the length of the major axis of the ellipse.

A. major axis

B. minor axis

C. latus rectum

D. none of these

Answer: A

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9. The line passing through the extremity A of major axis and extremity B of the minor axes of the ellipse $9x^2 + 16y^2 = 144$ meets the circle $x^2 + y^2 = 16$ at the point P. Then the area of the triangle OAP, O being the origin (in square units) is

A. 96/25

B. 192/25

C. 48/25

D. 96/50

Answer: B

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

ellipse is (1) $x^2 + 16y^2 = 16$ (2) $x^2 + 12y^2 = 16$ (3) $4x^2 + 48y^2 = 48$ (4) $4x^2 + 64y^2 = 48$

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

B. $4x^2 + 6y^2 = 48$

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

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

Answer: D

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11. A parabola has its latus rectum along PQ, where $P(x_1, y_1)$ and $Q(x_2, y_2), y_1 > 0, y_2 > 0$ are the end

points of the latus rectums of the ellipse $\frac{x^2}{4}+\frac{y^2}{1}=1$. Coordinates of the focus of the parabola are

A. (0,-1/2)

B. (0,0)

C. (0,1/2)

D. (0,1)

Answer: C

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12. Tangents are drawn from the point P(3,4) to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ touching the ellipse at points A and B.

The equation of the locus of the point whose distance from the point P and the line AB are equal, is:

A. $9x^2 + y^2 - 6xy - 54x - 62y + 241 = 0$

B. $x^2 + 9y^2 + 6xy - 54x + 62y - 241 = 0$

C. $9x^2 + 9y^2 - 6xy - 54x - 62y - 241 = 0$

D. $x^2 + y^2 - 2xy + 27x + 31y - 120 = 0$

Answer: A

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13. Equation of the ellipse whose axes are the axes of coordinates and which passes through the point $(-3, 1)$ and has eccentricity $\sqrt{\frac{2}{5}}$ is: (1) $3x^2 + 5y^2 - 32 = 0$ (2) $5x^2 + 3y^2 - 48 = 0$ (3) $3x^2 + 5y^2 - 15 = 0$ (4) $5x^2 + 3y^2 - 32 = 0$

A. $5x^2 + 3y^2 - 32 = 0$

B. $3x^2 + 5y^2 - 32 = 0$

C. $5x^2 + 3y^2 - 48 = 0$

D. $3x^2 + 5y^2 - 15 = 0$

Answer: B

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14. An ellipse is drawn by taking a diameter of the circle $(x-1)^2 + y^2 = 1$, as its semi-minor axis and a diameter of the circle $x^2 + (y-2)^2 = 4$ as its semi-major axis. If the centre of the ellipse is at the origin and its axes are the coordinate axes, then the equation of the ellipse is:

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

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

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

D. $x^2 + 4y^2 = 8$

Answer: B

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15. The ellipse $E_1 : \frac{x^2}{9} + \frac{y^2}{4} = 1$ is inscribed in a rectangle R whose sides are parallel to the coordinate axes. Another ellipse E_2 passing through the point (0, 4) circumscribes the rectangle R. The eccentricity of the ellipse E_2 is $\frac{\sqrt{2}}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

A. $\sqrt{2}/2$

B. $\sqrt{3}/2$

C. $1/2$

D. $3/4$

Answer: C

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16. A rod of length 12 cm moves with its ends always touching the coordinate axes. Determine the equation of the locus of a point P on the rod, which is 3 cm from the end in contact with the xaxis.

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

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

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

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

Answer: C

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17. Find the eccentricity of an ellipse whose latus rectum in one half of its major axis.

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

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

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

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

Answer: B

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18. If the equation $5\left[(x-2)^2+(y-3)^2\right]=\left(\lambda^2-2\lambda+1\right)(2x+y-1)^2$ represents an ellipse then

A. $\lambda \in (0, 2)$

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

C. $\lambda \in (0, 2) - \{1\}$

D. $\lambda \in (-1, 1) - \{0\}$

Answer: C

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19. If the line $lx + my + n = 0$ cuts the ellipse $\left(\frac{x^2}{a^2}\right) + \left(\frac{y^2}{b^2}\right) = 1$ at points whose eccentric angles differ by $\frac{\pi}{2}$, then find the value of $\frac{a^2l^2 + b^2m^2}{n^2}$.

A. 1

B. 2

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

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

Answer: B

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20. An ellipse has OB as the semi-minor axis, $FandF'$ as its foci, and $\angle FBF'$ a right angle. Then, find the eccentricity of the ellipse.

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

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

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

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

Answer: C

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21. The locus of the foot of perpendicular drawn from the centre of the ellipse $x^2 + 3y^2 = 6$ on any tangent to it is (1) $\left(x^2 - y^2\right)^2 = 6x^2 + 2y^2$ (2) $\left(x^2 - y^2\right)^2 = 6x^2 - 2y^2$ (3)

$\left(x^2+y^2\right)^2=6x^2+2y^2$ (4)

$\left(x^2+y^2\right)^2=6x^2-2y^2$

A. $\left(x^2-y^2\right)^2=6x^2+2y^2$

B. $\left(x^2-y^2\right)^2=6x^2-2y^2$

C. $\left(x^2+y^2\right)^2=6x^2+2y^2$

D. $\left(x^2+y^2\right)^2=6x^2-2y^2$

Answer: C

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22. The area (in sq. units) of the quadrilateral formed by the tangents at the end points of the latera recta

to the ellipse $\frac{x^2}{9}+\frac{y^2}{5}=1$, is: (1) $\frac{27}{4}$ (2) 18 (3) $\frac{27}{2}$ (4) 27

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

B. 18

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

D. 27

Answer: D

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23. If the distance between the foci of an ellipse is half the length of its latus rectum,then the

eccentricity of the ellipse is

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

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

C. $\sqrt{2}-1$

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

Answer: C

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24. The tangent to the ellipse $3x^2+16y^2=12$, at the point $\left(1, \frac{3}{4}\right)$ intersects the curves $y^2+x=0$ at :

A. no point

B. exactly one point

C. two distinct point

D. more than two points.

Answer: B

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25. The line 2x + y = 3 intersects the ellipse $4x^2 + y^2 = 5$ at two points. The tangents to the ellipse at these two points intersect at the point:

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

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

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

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

Answer: A

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Solved Examples Level 2 Single Correct Answer

1. If p is the length of the perpendicular from a focus upon the tangent at any point P of the the ellipse

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and r is the distance of P from the foicus , then $\frac{2a}{r} - \frac{b^2}{p^2}$ is equal to

A. -1

B. 0

C. 1

D. 2

Answer: C

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2. Find the eccentricity of the ellipse if $y = x$ and $3y + 2x = 0$ are the equations of a pair

of its conjugate diameters.

A. $\sqrt{2/3}$

B. $1/\sqrt{3}$

C. $1/\sqrt{2}$

D. $2/\sqrt{5}$

Answer: B

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3. If α, β are the eccentric angles of the extremities of a focal chord of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$, then $\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)$=

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

B. $-\frac{9}{23}$

C. $\frac{\sqrt{5}-4}{\sqrt{5}+4}$

D. $\frac{8\sqrt{7}-23}{9}$

Answer: D

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4. An ellipse slides between two perpendicular straight lines. Then identify the locus of its center.

A. a parabola

B. an ellipse

C. a hyperbola

D. a circle

Answer: D

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5. The locus of the point of intersection of the tangents at the extremities of the chords of the ellipse $x^2 + 2y^2 = 6$ which touch the ellipse $x^2 + 4y^2 = 4,$ is $x^2 + y^2 = 4$ (b) $x^2 + y^2 = 6$ $x^2 + y^2 = 9$ (d) None of these

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

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

C. $x^2 + y^2 = 9$

D. none of these

Answer: C

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6. The sum of the squares of the perpendiculars on any tangents to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ from two points on the minor axis each at a distance ae from the center is $2a^2$ (b) $2b^2$ (c) $a^2 + b^2$ $a^2 - b^2$

A. $2a^2$

B. $2b^2$

C. $a^2 + b^2$

D. $a^2 - b^2$

Answer: A

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7. The line $y = mx + c$ is a normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, if c

A. $\frac{\left(a^2 - b^2\right)^2}{a^2m^2 + b^2}$

B. $\frac{\left(a^2-b^2\right)^2}{a^2m^2}$

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

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

Answer: C

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8. A tangent to the ellipse $4x^2+9y^2=36$ is cut by the tangent at the extremities of the major axis at T and T^1, the circle on TT^1 as diameter passes through the point

A. $(0, \sqrt{5})$

B. $(\sqrt{5}, 0)$

C. $(2, 1)$

D. $(0, -\sqrt{5})$

Answer: B

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9. P is a point on the ellipse $E: \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and P' be the corresponding point on the auxiliary circle C: $x^2 + y^2 = a^2$. The normal at P to E and at P' to C intersect on circle whose radius is

A. a+b

B. a-b

C. 2a

D. 2b

Answer: A

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10. Find the equation of the common tangent in the first quadrant of the circle $x^2 + y^2 = 16$ and the ellipse $\frac{x^2}{25} + \frac{y^2}{4} = 1$.Also find the length of the

intercept of the tangent between the coordinates axes.

A. $7/\sqrt{3}$ units

B. $14/\sqrt{3}$ units

C. $4\sqrt{7}$ units

D. 14 units

Answer: B

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Solved Examples Numerical Answer

1. Let E_1 be the ellipse $\frac{x^2}{a^2+2}+\frac{y^2}{b^2}=1$ and E_2 be the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2+1}=1$. The number of points from which two perpendicular tangents can be drawn to each of E_1 and E_2 is

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2. The value of c(c $>$ 0) for which y=3x+c touches the curve $3x^2+4y^2-6x+16y+7=0$ is $\left(\sqrt{39}=6.24\right)$

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3. An ellipse has OB as the semi-minor axis, $FandF'$ as its foci, and $\angle FBF'$ a right angle. Then, find the eccentricity of the ellipse.

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4. P(h, k) is a point in the xy plane such that two perpendicular tangents can be drawn from P to $3x^2 + 4y^2 = 12$. Then $\frac{h^2 + k^2}{2}$ equals

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5. Let $F_1(0, 3)$ and $F_2(0, -3)$ be two points and P be any point on the ellipse $25x^2 + 16y^2 = 400$, then value of $(PF_1 + PF_2)$ is

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6. Let F_1, F_2 be two foci of the ellipse $\frac{x^2}{p^2+2} + \frac{y^2}{p^2+4} = 1$. Let P be any point on the ellipse , the maximum possible value of $PF_1 . PF_2 - p^2$ is

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7. Let m be slope of a common tangent to the circle $x^2 + y^2 = 4$ and the ellipse $\frac{x^2}{6} + \frac{y^2}{3} = 1$, then m^2 equals ($\sqrt{2}$ =1.41)

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8. Suppose (h, k) lies on the circle $x^2 + y^2$ =4, then (2h + 1, 3k + 2) lies on an ellipse with eccentricity e, then e^2 equals

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9. Consider family of ellipse having foci at (1, 3) and (3, 1) and touching both the axes. If r is the radius of the director circle of an ellipse from the family, then value of r^2 is ($\sqrt{2}$ = 1.41)

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10. Let E be an ellipse such that x+y= $2\sqrt{5}$ is a tangent to E and E passes through (3,-1). If axes of E are along the coordinates axes and e is the eccentricity of E, then e^2 equals _____

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11. If l is the length of the intercept made by a common tangent to the circle $x^2 + y^2 = 16$ and the ellipse $\frac{x^2}{25} + \frac{y^2}{4} = 1$, on the coordinate axes, then $81l^2 + 3$ is equal to

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12. If CF is perpendicular from the centre C of the ellipse $\frac{x^2}{49} + \frac{y^2}{25} = 1$ on the tangent at any port P and G is the point where the normal at P meets the minor axis, then $(CF \cdot PG)^2$ is equal to

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13. L: 3x - 4y = 0 is a diameter of the ellipse $\frac{x^2}{20} + \frac{y^2}{9} = 1$. Y=m'x is the diameter of the ellipse bisecting 20 9 the chords parallel to L. If m represents the slope of L, then the value of (m + m') is equal to

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14. The length of the semi-major axis of an ellipse is 8 and the eccentricity is $\frac{1}{2}$. If Δ denotes the area of the rectangle formed by joining the vertices of the latera recta of the ellipse then the value of Δ is equal to

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15. A vertical line passing through the point $(h, 0)$ intersects the ellipse $\frac{x^2}{4} + \frac{y^2}{3} = 1$ at the points P and Q.Let the tangents to the ellipse at P and Q meet at R. If $\delta(h)$ Area of triangle δPQR, and $\delta_1 \max_{\frac{1}{2} \le h \le 1} \delta(h)$ A further $\delta_2 \min_{\frac{1}{2} \le h \le 1} \delta(h)$ Then $\frac{8}{\sqrt{5}}\delta_1 - 8\delta_2$

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Exercise Single Correct

1. Equation of an ellipse with centre at the origin passing through (5, 0) and having eccentricity 2/3 is:

A. $4x^2 + 9y^2 = 100$

B. $9x^2 + 5y^2 = 225$

C. $5x^2 + 9y^2 = 125$

D. $6x^2 + 4y^2 = 150$

Answer: C

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2. Equation of a tangent to the ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$, passing through the point where a directrix of the ellipse meets the + ve x-axis is

A. $5y + \sqrt{11}x = 36$

B. $6y + \sqrt{11}x = 25$

C. $6y + \sqrt{11}x = 36$

D. $6y - \sqrt{11}x = 36$

Answer: C

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3. Equation of a line joining a foci of the ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$ to a foci of the ellipse $\frac{x^2}{9}+\frac{y^2}{25}=1$ is ,

A. x+y=4

B. x+y=5

C. x+y=3

D. 5x+3y=1

Answer: A

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4. If the eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{a^2} = 1$ and $\frac{x^2}{a^2} + \frac{y^2}{16} = 1$ is same, then the value of a^2 is :

A. 9

B. 41

C. 15

D. 20

Answer: D

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5. If y = mx + 4 is a tangent to the ellipse $\frac{x^2}{25} + \frac{y^2}{4} = 1$, then $625m^4 + 25m^2 - 156$ is equal to

A. -1

B. 0

C. 1

D. 4

Answer: B

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6. Length of a latus rectum of the ellipse $\frac{x^2}{81} + \frac{y^2}{63} = 1$ is (in units)

A. 9

B. 7

C. 14

D. 18

Answer: C

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7. The normal at the point $\left(3, 2\sqrt{3}\right)$ on the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$ meets the major axis of the ellipse at $(\alpha, 0)$, the value of α is :

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

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

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

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

Answer: A

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8. In an ellipse, the distances between its foci is 6 and minor axis is 8. Then its eccentricity is

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

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

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

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

Answer: B

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9. Let F_1, F_2 are the foci of the ellipse $4x^2 + 9y^2 = 36$ and P is a point on ellipse such that $PF_1 = 2PF_2$, then the area of triangle PF_1F_2 is

A. 1 sq. unit

B. 2 sq. unit

C. 3 sq. unit

D. 4 sq. unit

Answer: D

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10. If the eccentric angles of two points P and Q on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}$ are α, β such that $\alpha+\beta=\frac{\pi}{2}$, then the locus of the point of intersection of the normals at P and Q is

A. ax+by=0

B. ax-by=0

C. x+y=0

D. x+y=a+b

Answer: A

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11. $P_1(\theta_1)$ and $P_2(\theta_2)$ are two points on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ such that $\tan\theta_1 \tan\theta_2 = \frac{-a^2}{b^2}$. The chord joining P_1 and P_2 of the ellipse subtends a right angle at the

A. focus (ae,0)

B. focus (-ae, 0)

C. centre (0,0)

D. vertex (a,0)

Answer: C

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12. Find the center, foci, the length of the axes, and the eccentricity of the ellipse $2x^2 + 3y^2 - 4x - 12y + 13 = 0$

A. $\left(1 \pm \frac{1}{\sqrt{6}}, 2\right)$

B. $\left(2, 1 \pm \frac{1}{\sqrt{6}}\right)$

C. (1,2)

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

Answer: A

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13. $C_1 : x^2 + y^2 = a^2$ and $C_2 : x^2 + y^2 = b^2$ are two contentric circles. A line through the centre of these circles intersects them at P and respectively. If the lines through P and Q parallel to y-axis and x-axis respectively meet at the point R, then the locus of R is

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

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

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

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

Answer: C

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14. P is a point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1(a > b)$ and Q is the point corresponding to P on the auxiliary circle $x^2 + y^2 = a^2$. N is the foot of the perpendicular from P on the major axis of the ellipse. $\frac{PN}{PQ}$ is equal to:

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

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

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

D. $\frac{a}{a+b}$

Answer: A

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15. If the normal at any point P on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ meets the axes at $Gandg$, respectively, then find the raio $PG:Pg$.

A. $a^2:b^2$

B. $a:b$

C. $b:a$

D. $b^2:a^2$

Answer: D

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Exercise Level 1 Single Correct

1. On the ellipse $4x^2 + 9y^2 = 1$, the points at which the tangent are parallel to the line $8x = 9y$ are

A. (2/5,1/5)

B. (-2/5, 1/5)

C. (-2/5 , -1/5)

D. none of these

Answer: B

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

A. $(\pm\sqrt{5}/3, 0)$

B. $(\pm\sqrt{5}/6, 0)$

C. $(0, \pm\sqrt{5}/3)$

D. $(0, \pm\sqrt{5}/6)$

Answer: B

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3. The distance of the point $\left(\sqrt{6}\cos\theta, \sqrt{2}\sin\theta\right)$ on the ellipse from the centre of the ellipse is 2 if θ =

A. $\pi/6$

B. $\pi/4$

C. $\pi/3$

D. none of these

Answer: B

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4. An equation of the normal to the ellipse $x^2/a^2 + y^2/b^2 = 1$ with eccentricity e at the positive end of the latus rectum is

A. $x + ey + e^3a = 0$

B. $x - ey - ae^3 = 0$

C. $x - ey + e^3a = 0$

D. $x + ey - e^3a = 0$

Answer: B

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5. The circle $x^2 + y^2 = c^2$ contains the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ if

A. $c < a$

B. $c < b$

C. $c >$ max {a,b}

D. $c > b$

Answer: C

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6. In an ellipse, if the lines joining focus to the extremities of the minor axis form an equilateral triangle with the minor axis, then the eccentricity of the ellipse is

A. $3/4$

B. $\sqrt{3}/2$

C. $1/2$

D. $2/3$

Answer: B

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7. An equilateral triangle is inscribed in the ellipse $x^2 + 3y^2 = 3$ such that one vertex of the triangle is (0, 1) and one altitude of the triangle is along the y-axis. The length of its side is

A. $4\sqrt{3}/5$

B. $3\sqrt{3}/5$

C. $6\sqrt{3}/5$

D. $2\sqrt{3}$

Answer: C

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8. If the equation $\frac{x^2}{10-2a}+\frac{y^2}{4-2a}=1$ represents an ellipse , then a lies in the interval

A. $(-\infty, 5)$

B. $(2, 5)$

C. $(-\infty, 2)$

D. $(5, \infty)$

Answer: C

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9. The curve represented by x = 3 (cos t + sin t), y = 4 (cos t- sin t) is an ellipse whose eccentricity is e, such that $16e^2 + 7$ is equal to:

A. 14

B. 12

C. 11

D. 21

Answer: A

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10. The eccentricity of an ellipse, with centre at the origin is 2/3. If one of directrices is x = 6, then equation of the ellipse is

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

B. $\frac{x^2}{9} + \frac{y^2}{5} = 1$

C. $5x^2 + 9y^2 = 80$

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

Answer: C

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11. The locus of the foot of the perpendicular from the foci an any tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, is

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

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

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

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

Answer: B

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12. If the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and the circle $x^2+y^2=r^2$ where $b<r<a$ intersect in four points and the slope of a common tangent to the ellipse and the circle is $\frac{b}{a}$, then r^2 is equal to

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

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

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

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

Answer: B

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13. The product of the perpendiculars from the foci of the ellipse $\frac{x^2}{144} + \frac{y^2}{100} = 1$ on any tangent is:

A. 144

B. 100

C. 122

D. 200

Answer: B

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14. The locus of the foot of the perpendicular drawn from the centre on any tangent to the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is:

A. $25x^2 + 16y^2 = \left(x^2 + y^2\right)^2$

B. $25x^2 + 16y^2 = 9$

C. $16x^2 + 25y^2 = 1$

D. $x^2 + y^2 = 41$

Answer: A

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15. If the normal at $P\left(2\frac{3\sqrt{3}}{2}\right)$ meets the major axis of ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ at Q, and S and S' are the foci of the given ellipse, then find the ratio $SQ:S'Q$.

A. $\frac{8}{\sqrt{7}}$

B. $\frac{7+\sqrt{8}}{7-\sqrt{8}}$

C. $\frac{8+\sqrt{7}}{8-\sqrt{7}}$

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

Answer: C

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16. Chord of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ whose middle point is $\left(\frac{1}{2}, \frac{2}{5}\right)$ meets the minor axis at A and major axis at B, length of AB (in units) is :

A. $\frac{\sqrt{41}}{5}$

B. $\frac{2\sqrt{41}}{5}$

C. $\frac{3\sqrt{41}}{5}$

D. $\frac{7\sqrt{41}}{5}$

Answer: A

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17. If one extremity of the minor axis of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the foci form an equilateral triangle, then its eccentricity, is

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

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

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

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

Answer: A

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18. The length of the major axis of the ellipse $(5x-10)^2+(5y+13)^2=\frac{(3x-4y+7)^2}{4}$ is

A. $\frac{10}{3}$ units

B. 5 units

C. $\frac{20}{3}$ units

D. $\frac{5}{3}$ units

Answer: C

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19. A tangent to the ellipes $\frac{x^2}{25}+\frac{y^2}{16}=1$ at any points meet the line $x=0$ at a point Q Let R be the image of Q in the line $y=x,$ then circle whose extremities of a dameter are Q and R passes through a fixed point, the fixed point is

A. (5,5)

B. (4,5)

C. (1,1)

D. (0,0)

Answer: D

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20. Let P be any point on a directrix of an ellipse of eccentricity e, S be the corresponding focus and C be the centre of the ellipse. The line PC meets the ellipse at A. The angle between PS and tangent at A is α. Then α is equal to

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

B. $\tan^{-1}(1/e)$

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

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

Answer: C

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21. If a tangent of slope 2 of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is normal to the circle $x^2+y^2+4x+1=0$, then the maximum value of ab is 4 (b) 2 (c) 1 (d) none of these

A. 1

B. 2

C. 3

D. 4

Answer: D

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22. If a line $3px + 2y\sqrt{1-p^2} = 1$ touches a fixed ellipse E for all p $\in$ [- 1, 1], then equation of a directrix of E the ellipse is:

A. $x = \frac{3\sqrt{5}}{10}$

B. $y = \frac{3\sqrt{5}}{10}$

C. $x = \frac{\sqrt{5}}{3}$

D. $y = \frac{\sqrt{5}}{3}$

Answer: B

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23. If a and b are the natural numbers such that a + b = ab, then equation of the chord of the ellipse $x^2 + 4y^2 = 4$ with (a,b) as the mid point is :

A. x+4y=2

B. x+4y=10

C. 4x+y=2

D. 4x+y=10

Answer: B

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24. If $\frac{x^2}{\sec^2\theta} + \frac{y^2}{\tan^2\theta} = 1$ represents an ellipse with eccentricity e and length of the major axis l then

A. e is independent of θ

B. l is independent of θ

C. el is independent of θ

D. $l^2 - e^2$ is independent of θ

Answer: C

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25. $3x^2 + 4y^2 - 6x + 8y + k = 0$ represents an ellipse with eccentricity 1/2,

A. for all value of k

B. for k $>$ 7

C. $k < 7$

D. k=7

Answer: C

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Exercise Level 2 Single Correct

1. If chords of contact of the tangent from two points (x_1, y_1) and (x_2, y_2) to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ are at right angles , then $\frac{x_1 x_2}{y_1 y_2}$ is equal to

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

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

C. $\frac{-a^4}{b^4}$

D. $\frac{b^4}{a^4}$

Answer: C

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2. If the normal at the point $P(\theta)$ to the ellipse $\frac{x^2}{14}+\frac{y^2}{5}=1$ intersects it again at the point $Q(2\theta)$, then $\cos\theta$ is equal to (A) $\frac{2}{3}$ (B) $\frac{-2}{3}$ (C) $\frac{3}{4}$ (D) non of these

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

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

C. $\frac{-6}{7}$

D. $\frac{6}{7}$

Answer: A

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3. Let E be the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and C be the circle $x^2 + y^2 = 9$. Let P and Q be the points (1, 2) and (2, 1) respectively. Then,

A. Q lies inside C but outside E

B. Q lies outside both C and E

C. P lies inside both C and E

D. P lies inside C but out side E

Answer: D

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4. If CF is perpendicular from the centre of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ to the tangent at P, G is the point where the normal at P meets the major axis, then CF.

PG =

A. 9

B. 18

C. 25

D. 34

Answer: A

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5. If the tangent at the point $P(\theta)$ to the ellipse $16x^2 + 11y^2 = 256$ is also a tangent to the circle $x^2 + y^2 - 2x = 15$, then $\theta =$ $\frac{2\pi}{3}$ (b) $\frac{4\pi}{3}$ (c) $\frac{5\pi}{3}$ (d) $\frac{\pi}{3}$

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

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

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

D. $\frac{5\pi}{6}$

Answer: C

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6. If lx+my+n=0 is an equation of the line joining the extremities of a pair of semi-conjugate diameters of the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$, then $\frac{9l^2+4m^2}{n^2}$ is equal to

A. -1

B. 0

C. 1

D. 2

Answer: D

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7. Let f be a strictly decreasing function defined on R such that $f(x) > 0 \ \forall \ x \in R$, and $\frac{x^2}{f(a^2+5a+3)} + \frac{y^2}{f(3a+15)} = 1$ represents an ellipse with major axis along the y-axis , then

A. $a \notin (-\infty, -6)$

B. $a \notin (2, \infty)$

C. $a \notin (-6, 2)$

D. $a > 0$

Answer: C

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8. Number of points from which two perpendicular tangents can be drawn to both the ellipses $E_1 : \frac{x^2}{a^2+2} + \frac{y^2}{b^2} = 1$ and $E_2 : \frac{x^2}{a^2} + \frac{y^2}{b^2+1} = 1$ is

A. 0

B. 1

C. 2

D. infinitely many

Answer: A

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9. Let d be the perpendicular distance from the centre of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ to the tangent drawn at a point P on the ellipse. If $F_1 \& F_2$ are the two foci of the ellipse, then show the $(PF_1-PF_2)^2=4a^2\left[1-\frac{b^2}{d^2}\right]$.

A. $4b^2\left(1-\frac{a^2}{d^2}\right)$

B. $4d^2\left(1-\frac{b^2}{a^2}\right)$

C. $4a^2\left(1-\frac{b^2}{d^2}\right)$

D. $4a^2$

Answer: C

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10. Find the values of a for which three distinct chords drawn from $(a, 0)$ to the ellipse $x^2 + 2y^2 = 1$ are bisected by the parabola $y^2 = 4x$.

A. $4 < a < 8$

B. $8 < a < 4 + \sqrt{17}$

C. $0 < a < \sqrt{17} - 4$

D. $0 < a < 4$

Answer: B

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11. Let C be the centre of the ellipse E whose equation is $3x^2 + 4y^2 - 12x + 8y + k = 0$ where k $<$ 28. Let A and B be two points on the ellipse such that $\angle ACB = \pi/2$, then (14 - k/2) $(CA)^{-2} + (CB)^{-2}$) equals

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12. Let e the eccentricity of the ellipse passing through A(1, -1) and having foci at F_1(-2, 3) and F_2(5, 2), then e^2 equals

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13. Let e be the eccentricity of the ellipse represented by x=5 $(2\cos\theta + 3\sin\theta)$, y =4 (2 sin θ-3 cos θ), then e^2 equals

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14. Number of points on the ellipse $\frac{x^2}{25} + \frac{y^2}{7} = 1$ whose distance from the centre of the ellipse is $2\sqrt{7}$ is

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15. The number of lattice points (that is point with both coordinates as integers) on the ellipse $\frac{x^2}{49}+\frac{y^2}{25}=1$ is

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16. Number of points on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at which the normal to the ellipse passes through at least one of the foci of the ellipse is

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17. Suppose the eccentricity of the ellipse $\frac{x^2}{a^2+3}+\frac{y^2}{a^2+4}=1$ is $1/\sqrt{8}$. Let l be the latus rectum of the ellipse, then l equals

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18. Suppose the ellipse $\frac{x^2}{2}+y^2=1$ and the ellipse $\frac{x^2}{5}+\frac{y^2}{a^2}=1$ where $a^2=b^2-8b+13$ intersect in four distinct points, then number of integral values of b is

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19. Let e be the eccentricity of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ where $0<b<4$. Let p_1, p_2 be the lengths of perpendicular from (0,4e) and (0,-4e) to any tangent to the ellipse , then values of $\frac{\left(p_1^2+p_2^2\right)}{5}$ is

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Previous Years Aieee Jee Main Papers

1. The eccentricity of an ellipse with its centre at the origin is $\frac{1}{2}$. If one of the directrices is x = 4 , then the equation of ellipse is

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

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

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

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

Answer: B

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2. Area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

A. $\sqrt{ab}$

B. a/b

C. 2ab

D. ab

Answer: C

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3. An ellipse has OB as the semi-minor axis, $FandF'$ as its foci, and $\angle FBF'$ a right angle. Then, find the eccentricity of the ellipse.

A. $1/4$

B. $1/\sqrt{3}$

C. $1/\sqrt{2}$

D. $1/2$

Answer: C

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4. In an ellipse, the distances between its foci is 6 and minor axis is 8. Then its eccentricity is

A. $1/\sqrt{5}$

B. $3/5$

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

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

Answer: B

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5. A focus of an ellipse is at the origin. The directrix is the line $x = 4$ and the eccentricity is 1/2. Then the length of the semimajor axis is (1) $\frac{8}{3}$ (2) $\frac{2}{3}$ (3) $\frac{4}{3}$ (4) $\frac{5}{3}$

A. $5/3$

B. $8/3$

C. $2/3$

D. $4/3$

Answer: B

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6. The ellipse $x^2 + 4y^2 = 4$ is inscribed in a rectangle aligned with the coordinate axes, which in turn is inscribed in another ellipse that passes through the point (4, 0). Then the equation of the ellipse is (1) $x^2 + 16y^2 = 16$ (2) $x^2 + 12y^2 = 16$ (3) $4x^2 + 48y^2 = 48$ (4) $4x^2 + 64y^2 = 48$

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

B. $4x^2 + 6y^2 = 48$

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

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

Answer: D

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7. Equation of the ellipse whose axes are the axes of coordinates and which passes through the point $(-3, 1)$ and has eccentricity $\sqrt{\frac{2}{5}}$ is: (1)

$3x^2 + 5y^2 - 32 = 0$ (2) $5x^2 + 3y^2 - 48 = 0$ (3)

$3x^2 + 5y^2 - 15 = 0$ (4) $5x^2 + 3y^2 - 32 = 0$

A. $5x^2 + 3y^2 - 32 = 0$

B. $3x^2 + 5y^2 - 32 = 0$

C. $5x^2 + 3y^2 - 48 = 0$

D. $3x^2 + 5y^2 - 15 = 0$

Answer: B

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8. An ellipse is drawn by taking a diameter of the circle $(x-1)^2 + y^2 = 1$, as its semi-minor axis and a

diameter of the circle $x^2 + (y-2)^2 = 4$ as its semi-major axis. If the centre of the ellipse is at the origin and its axes are the coordinate axes, then the equation of the ellipse is:

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

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

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

D. $x^2 + 4y^2 = 8$

Answer: C

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9. If a and c are positive real number and the ellipse $\frac{x^2}{4c^2} + \frac{y^2}{c^2} = 1$ has four distinct points in common with the circle $x^2 + y^2 = 9a^2$, then

A. $9ac - 9a^2 - 2c^2 < 0$

B. $6ac + 9a^2 - 2c^2 < 0$

C. $9ac - 9a^2 - 2c^2 > 0$

D. $6ac + 9a^2 - 2c^2 > 0$

Answer: A

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10. Let the equations of two ellipses be $E_1 = \frac{x^2}{3} + \frac{y^2}{2} = 1$ and $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$.If the product of their eccentricities is $\frac{1}{2}$, then the length of the minor axis of ellipse E_2 is

A. 8

B. 9

C. 4

D. 2

Answer: C

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11. If the curves $\frac{x^2}{\alpha} + \frac{y^2}{4} = 1$ and $y^2 = 16x$ intersect at right angles, then a value of α is

A. 2

B. $4/3$

C. $1/2$

D. $3/4$

Answer: A

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12. A point on the ellipse, $4x^2 + 9y^2 = 36$, where the normal is parallel to the line, $4x - 2y - 5 = 0$ is (A) $\left(\frac{8}{5}, -\frac{9}{5}\right)$ (B) $\left(-\frac{9}{5}, \frac{8}{5}\right)$ (C) $\left(\frac{8}{5}, \frac{9}{5}\right)$ (D) $\left(\frac{9}{5}, \frac{8}{5}\right)$

A. $\left(\frac{9}{5}, \frac{8}{5}\right)$

B. $\left(\frac{8}{5}, \frac{-9}{5}\right)$

C. $\left(-\frac{9}{5}, \frac{8}{5}\right)$

D. $\left(\frac{8}{5}, \frac{9}{5}\right)$

Answer: A

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13. The locus of the foot of perpendicular drawn from the centre of the ellipse $x^2 + 3y^2 = 6$ on any tangent to it is (1) $\left(x^2 - y^2\right)^2 = 6x^2 + 2y^2$ (2) $\left(x^2 - y^2\right)^2 = 6x^2 - 2y^2$ (3) $\left(x^2 + y^2\right)^2 = 6x^2 + 2y^2$ (4) $\left(x^2 + y^2\right)^2 = 6x^2 - 2y^2$

A. $\left(x^2 - y^2\right)^2 = 6x^2 + 2y^2$

B. $\left(x^2 - y^2\right)^2 = 6x^2 - 2y^2$

C. $\left(x^2 + y^2\right)^2 = 6x^2 + 2y^2$

D. $\left(x^2 + y^2\right)^2 = 6x^2 - 2y^2$

Answer: C

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14. If OB is the semi-minor axis of an ellipse, F_1 and F_2 are its foci and the angle between F_1B and F_2B is a right angle, then the square of the eccentricity of the ellipse is

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

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

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

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

Answer: A

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15. The minimum area of the triangle formed by any tangent to the ellipse $\frac{x^2}{16} + \frac{y^2}{81} = 1$ and the coordinate axes is :

A. 12

B. 18

C. 26

D. 36

Answer: D

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16. The area (in sq. units) of the quadrilateral formed by the tangents at the end points of the latera recta to the ellipse $\frac{x^2}{9}+\frac{y^2}{5}=1$, is: (1) $\frac{27}{4}$ (2) 18 (3) $\frac{27}{2}$ (4) 27

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

B. 18

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

D. 27

Answer: D

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17. If the distance between the foci of an ellipse is half the length of its latus rectum,then the eccentricity of the ellipse is

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

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

C. $\sqrt{2}-1$

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

Answer: C

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18. If the tangent at a point on the ellipse $\frac{x^2}{27} + \frac{y^2}{3} = 1$ meets the coordinate axes at A and B, and the origin, then the minimum area (in sq. units) of the triangle OAB is:

A. $3\sqrt{3}$

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

C. 9

D. $9\sqrt{3}$

Answer: C

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19. Let $z \in C$, the set of complex numbers. Thenthe equation, $2|z+3i| - |z-i| = 0$ represents :

A. a circle with radius 8/3

B. a circle with diameter 10/3

C. an ellipse with length of major axis 16/3

D. an ellipse with length of minor axis 16/9

Answer: A

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20. Consider an ellipse, whose centre is at the origin and its major axis is along x-axis. if its eccentricity is 3/5 and the distance between its foci is 6, then the area (in sq. units) of the quadrilateral inscribed in the ellipse, with the vertices as the vertices of the ellipse, is

A. 8

B. 32

C. 80

D. 40

Answer: D

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21. The eccentricity of an ellipse having centre at the origin, axes along the co-ordinate axes and passing through the points $(4, -1)$ and $(-2, 2)$ is:

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

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

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

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

Answer: C

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22. The eccentricity of an ellipse whose centre is at the origin is $\frac{1}{2}$. if one of its directrices is $x = -4$, then the equation of the normal to it at $\left(1, \frac{3}{2}\right)$ is:

$4x + 2y = 7$ (2) $x + 2y = 4$ (3) $2y - x = 2$ (4) $4x - 2y = 1$

A. x+2y=4

B. 2y-x=2

C. 4x-2y=1

D. 4x+2y=7

Answer: C

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23. if tangents are drawn to the ellipse $x^2 + 2y^2 = 2$ all points on theellipse other its four vertices then the mid-points of the tangents intercepted between the coorinate axs lie on the curve

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

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

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

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

Answer: C

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24. Let the length of the latus rectum of an ellipse with its major axis along x-axis and centre at the origin be 8. If the distance between the foci of this ellipse is equal to the length of its minor axis, then which one of the following points lie on it

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

B. $\left(4\sqrt{3}, 2\sqrt{2}\right)$

C. $\left(4\sqrt{2}, 2\sqrt{3}\right)$

D. $\left(4\sqrt{2}, 2\sqrt{5}\right)$

Answer: B

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1. In an ellipse, the distance between its directrices is four times the distance between its foci. If (-2, 0) is one of its vertices, then the equation of the ellipse is

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

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

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

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

Answer: C

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2. The tangent to the ellipse $3x^2 + 16y^2 = 12$, at the point $\left(1, \frac{3}{4}\right)$, intersects the curve y + x = 0 at:

A. no point

B. exactly one point

C. two distinct points

D. more than two points

Answer: B

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3. Let P be a point in the first quadrant lying on the ellipse $9x^2 + 16y^2 = 144$, such that the tangent at P to the ellipse is inclined at an angle of 135° to the positive direction of x-axis. The n the coordinates of P are

A. $\left(\frac{\sqrt{143}}{3}, \frac{1}{4}\right)$

B. $\left(\frac{8}{9}, \frac{\sqrt{77}}{3}\right)$

C. $\left(\frac{4}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right)$

D. $\left(\frac{16}{5}, \frac{9}{5}\right)$

Answer: D

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4. The line $2x + y = 3$ intersects the ellipse $4x^2 + y^2 = 5$ at two points. The point of intersection of the tangents to the ellipse at these point is

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

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

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

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

Answer: A

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5. The product of the perpendiculars drawn from the loci of the ellipse $\frac{x^2}{9}+\frac{y^2}{25}=1$ upon the tangent to it at the point $\left(\frac{3}{2}, \frac{5\sqrt{3}}{2}\right)$ is

A. $3\sqrt{13}$

B. 9

C. $189/13$

D. 18

Answer: B

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6. If an ellipse has its foci at $(2, 0)$ and $(-2, 0)$ and its length of the latus rectum is 6, then the equation of the ellipse is:

A. $\frac{x^2}{64} + \frac{y^2}{24} = 1$

B. $\frac{x^2}{36} + \frac{y^2}{18} = 1$

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

D. $\frac{x^2}{24} + \frac{y^2}{64} = 1$

Answer: C

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