MATHS

JEE (MAIN AND ADVANCED) MATHEMATICS

ELLIPSE

SOLVED EXAMPLES

1. Find the equation of the ellipse whose focus is (0,3),eccentricity is $\frac{3}{5}$ and the directrix is 3y - 25 = 0

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2. Find the equation of the ellipse whose latus rectum 15 is $\frac{15}{2}$ and the distance between the foci is 2, with the axis being

coordinate axes.

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3. Find the equation of the ellipse whose centre is (4, -1) one end of major axis is (-1, -1) and passes through the point (8,0).

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4. Find the equation of the ellipse of eccentricity - , $\frac{1}{2}$ centre (2, -1) and having the latusrectum equal to 4.

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5. The equation of the ellipse whose vertices are (4, 1), (6, 1) whose focus lies on the line $x - 2y = 2$ is

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6. Find the length of the major axis, minor axis, latus rectum, eccentricity, centre, foci and the equations to the directrices of the ellipse.

$(i) 3x^2 + y^2 - 6x - 2y - 5 = 0$

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7. If the angle between the straight lines joining foci and ends of the minor axis of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^{12}} = 1$ is 90° find the eccentricity

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8. C is the centre, AA' and BB' are Major and minor Axes of the ellipse $\frac{x^2}{aA^2}+\frac{y^2}{b^2}=1$ respectively. If PN a b is the ordinate of a point P on the ellipse then show that $\frac{(PN)^2}{A'N}(AN)=\frac{(BC)^2}{(CA)^2}$

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9. If $p(\theta)$ is a point on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1(a>b)$ then find its coresponding point

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10. The orbit of the Earth is an ellipse with eccentricity $\frac{1}{60}$ with the Sun at one of its foci, the major axis being approximately

186×10^6 miles in length. Find the shortest and longest distance of the Earth from the Sun.

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11. Find the equations of tangents to the ellipse $2x^2 + y^2 = 8$ which are

which makes an angle $\frac{\pi}{4}$ with x-axis.

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12. Find the equations of the tangest and normal at $\left(-\frac{4}{3}, 1\right) \text{to} 9x^2 + 4y^2 = 20$

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13. Find the equation of tangent and normal to the ellipse $x^2 + 8y^2 = 33$ at (-1,2).

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14. If $x + ky - 5 = 0$ is a tangent to the ellipse $4x^2 + 9y^2 = 20$ then k =

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15. Show that the line x + 2y - 4 = 0 touches the ellipse $3x^2 + 4y^2 = 12$ also find the point of contact.

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16. Find the co-ordinates for the points on the ellipse $x^2 + 3y^2 + 37$ at which the normal is parallel to the line 6x-5y=2.

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17. Show that the common tangent of the ellipse $3x^2 + 13y^2 = 78$ and the circle $x^2 + y^2 = 16$ is inclined at 45° with the major axis.

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18. Show that the locus of the foot of the perpendicular drawn from centre on any tangent to the ellipse $b^2x^2 + a^2y^2 = a^2b^2$ is the curve $\left(x^2 + y^2\right)^2 = a^2x^2 + b^2y^2$

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19. Find the equations of the tangent drawn to the ellipse $\frac{x^2}{3} + y^2 = 1$ from the point (2, -1)

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20. Prove that the product of the perpendicular from the foci on any tangent to the ellips $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ =1 is equal to b^2

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21. If a circle is concentric with the ellipse, find the inclination of their common tangent to the major axis of the ellipse.

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22. Find the equation of the tangent and normal at $\frac{\pi}{4}$ on the ellipse to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$

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23. $P(\theta)$ and $D\left(\frac{\pi}{2}+\theta\right)$ are two points on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. Show that the locus of the point of intersection of tangents at P and Q to the ellipse is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=2$

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24. If PN is the ordinate of a point P on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and the tangent at P meets the x-axis at T then show that (CN) (CT)=a^2 where C is the centre of the ellipse.

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25. If $\alpha - \beta$ is constant prove that the chord joining the points α and β on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ =1 touches a fixed ellipse

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26. Let P be a variable point on the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ with foci at S and S'. Then find the maximum area of the triangle SPS'

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27. Find the equation of the ellipse whose focus is (0,3),eccentricity is $\frac{3}{5}$ and the directrix is 3y - 25 = 0

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28. Find the equation of the ellipse whose latus rectum 15 is $\frac{15}{2}$ and the distance between the foci is 2, with the axis being coordinate axes.

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29. Find the equation of the ellipse whose centre is (4, -1) one end of major axis is (-1, -1) and passes through the point (8,0).

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30. Find the equation of the ellipse of eccentricity - ,$\frac{1}{2}$ centre (2, -1) and having the latusrectum equal to 4.

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31. Find the equation of the ellipse whose vertices are (5,0) and (-5,0) and whose focus on the line $3x - 5y = 0$

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32. Find the length of the major axis, minor axis, latus rectum, eccentricity, centre, foci and the equations to the directrices of the ellipse.

$(i) 3x^2 + y^2 - 6x - 2y - 5 = 0$

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33. Find the length of the major axis, minor axis, latus rectum, eccentricity, centre, focii and the equation of the directrices to the ellipse:

$(-x-2)^2 + 4(y+3)^2 = 8$

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34. Find the equation of the ellipse whose axes are parallel to the coordinate axes having its centre at the point (2, -3) one focus at (3, -3) and one vertex at (4,-3)

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35. The orbit of the Earth is an ellipse with eccentricity $\frac{1}{60}$ with the Sun at one of its foci, the major axis being approximately 186×10^6 miles in length. Find the shortest and longest distance of the Earth from the Sun.

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36. Find the equations of tangents to the ellipse $2x^2 + y^2 = 8$ which are

which makes an angle $\frac{\pi}{4}$ with x-axis.

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37. Find the equations of the tangest and normal at $\left(-\frac{4}{3}, 1\right) \text{to} 9x^2 + 4y^2 = 20$

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38. Find the equations of the tangent and normal to the ellipse $x^2 + 2y^2 - 4x + 12y + 14 = 0$ at (2,-1)

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39. If $x + ky - 5 = 0$ is a tangent to the ellipse $4x^2 + 9y^2 = 20$ then k =

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40. Find the point of contant of the tangent line $4x + y - 7 = 0$ with the ellipse $x^2 + 3y^2 = 3$

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41. Find the co-ordinates for the points on the ellipse $x^2 + 3y^2 + 37$ at which the normal is parallel to the line 6x-5y=2.

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42. Show that the common tangent of the ellipse $3x^2 + 13y^2 = 78$ and the circle $x^2 + y^2 = 16$ is inclined at 45° with the major axis.

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43. Show that the locus of the foot of the perpendicular drawn from centre on any tangent to the ellipse $b^2x^2 + a^2y^2 = a^2b^2$ is the curve $\left(x^2 + y^2\right)^2 = a^2x^2 + b^2y^2$

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44. Find the equations of the tangent drawn to the ellipse $\frac{x^2}{3} + y^2 = 1$ from the point (2,-1)

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45. The product of the perpendiculars from the foci on any tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ is

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46. If the normal at one end of a latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ passes through one end of the minor axis, then show that $e^4 + e^2 = 1$[e is the eccentricity of the ellipse]

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47. If a circle is concentric with the ellipse, find the inclination of their common tangent to the major axis of the ellipse.

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48. Find the equation of the tangent and normal at $\frac{\pi}{4}$ on the ellipse to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$

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49. $P(\theta)$ and $D\left(\frac{\pi}{2}+\theta\right)$ are two points on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. Show that the locus of the point of intersection of tangents at P and Q to the ellipse is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=2$

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50. Find the equation of the chord joining point $P(\alpha)$ and $Q(\beta)$ on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.

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51. The tangent at 'p' on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ cuts the major axis in T and PN is the perpendicular to the x-axis, C being centre then CN.CT =

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52. The locus of the point of intersection of the perpendicular tangents to the ellipse $x^2/a^2+y^2/b^2=1$ is

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53. C is the centre, AA' and BB' are Major and minor Axes of the ellipse $\frac{x^2}{aA^2}+\frac{y^2}{b^2}=1$ respectively. If PN a b is the ordinate of a point P on the ellipse then show that $\frac{(PN)^2}{A'N}(AN)=\frac{(BC)^2}{(CA)^2}$

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54. The tangent to $x^2/a^2 + y^2/b^2 = 1$ meets the major and minor axes in P and Q respectively, then $a^2/CP^2 + b^2/CQ^2 =$

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55. If PN is the ordinate of a point P on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the tangent at P meets the x-axis at T then show that (CN) (CT)=a^2 where C is the centre of the ellipse.

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56. The tangent and normal to the ellipse $x^2 + 4y^2 = 4$ at a point $P(\theta)$

on it meets the major axis in Q and R respectively.If $\theta < \theta < \frac{\pi}{2}$ and $QR = 2$ then show that $\theta = \cos^{-1}\left(\frac{2}{3}\right)$.

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57. If any two chords be drawn through two points on the major axis of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ equidistant from the centre prove that $\tan\frac{\alpha}{2}\tan\frac{\beta}{2}\tan\frac{\gamma}{2} = 1$ where $\alpha, \beta, \gamma, \delta$ are the eccentricity angles of the extremities of the chord.

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62. Find the equation of ellipse whose vertices are (5,0) and (-5,0) and whose focus lies on the line $3x - 5y = 9$

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63. Find the length of the major axis, minor axis, latus rectum, eccentricity, centre, foci and the equations to the directrices of the ellipse.

$(i) 3x^2 + y^2 - 6x - 2y - 5 = 0$

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75. Prove that the product of the perpendicular from the foci on any tangent to the ellips $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ =1 is equal to b^2

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76. If the normal at one end of a latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ passes through one end of the minor axis, then show that $e^4 + e^2 = 1$[e is the eccentricity of the ellipse]

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78. Find the equation of the tangent and normal at $\frac{\pi}{4}$ on the ellipse to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$

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79. $P(\theta)$ and $D\left(\frac{\pi}{2}+\theta\right)$ are two points on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. Show that the locus of the point of intersection of tangents at P and Q to the ellipse is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=2$

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80. Prove that the chord joining points $P(\alpha)$ and $Q(\beta)$ on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ subtends a right angle at the vertex A(a,0) then $\tan\frac{\alpha}{2}\tan\frac{\beta}{2}=\frac{-b^2}{a^2}$.

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81. The tangent at 'p' on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ cuts the major axis in T and PN is the perpendicular to the x-axis, C being centre then CN.CT =

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82. Find the locus of the point of intersection of tangents to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at the points the sum of whose ordinates are constant.

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83. C is the centre, AA' and BB' are Major and minor Axes of the ellipse $\frac{x^2}{aA^2}+\frac{y^2}{b^2}=1$ respectively. If PN a b is the ordinate of a point P on the ellipse then show that $\frac{(PN)^2}{A'N}(AN)=\frac{(BC)^2}{(CA)^2}$

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84. The tangent to $x^2/a^2+y^2/b^2=1$ meets the major and minor axes in P and Q respectively, then $a^2/CP^2+b^2/CQ^2=$

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85. If PN is the ordinate of a point P on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and the tangent at P meets the x-axis at T then show that (CN)

(CT)=a^2 where C is the centre of the ellipse.

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86. The tangent and normal to the ellipse $x^2 + 4y = 4$ at a point $P(\theta)$ on it meets the major axis is Q and R respectively. IF $\theta < \theta < \frac{\pi}{2}$ and QR=2 then show that $\theta = \cos^{-1}\left(\frac{2}{3}\right)$

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87. If any two chords be drawn through two points on the major axis of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ equidistant from the centre prove that $\tan\frac{\alpha}{2}\tan\frac{\beta}{2}\tan\frac{\gamma}{2} = 1$ where $\alpha, \beta, \gamma, \delta$ are the eccentricity angles of the extremities of the chord.

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EXAMPLE

1. Let P be a variable point on the ellipse with foci S_1 and S_2 . If A be the area of $\triangle PS_1S_2$ then find the maximum value of A

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2. If a,P are the eccentric angles of the extremeties of a focal chord of the ellipse

(i) $e\dfrac{\cos(\alpha+\beta)}{2}=\dfrac{\cos(\alpha-\beta)}{2}$

(ii) $\dfrac{\tan(\alpha)}{2}\dfrac{\tan(\beta)}{2}=\dfrac{e-1}{e+1}$

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3. If α, β are the eccentric angles of the extremeties of a focal chord of the ellipse

(i) $e\frac{\cos(\alpha+\beta)}{2}=\frac{\cos(\alpha-\beta)}{2}$

(ii) $\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)=\frac{e-1}{e+1}$

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4. The tangent to $x^2/a^2+y^2/b^2=1$ meets the major and minor axes in P and Q respectively, then $a^2/CP^2+b^2/CQ^2=$

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5. Find the major axis, minor axis, and eccentricity to the ellipse $4(x-2y+1)^2+9(2x+y+2)^2=180$

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6. Find the equation to the ellipse whose axes are of lengths 6 and $2\sqrt{6}$ and their equations are 3x + y -1 = 0 and x-3y + 3 = 0 respectively

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7. The centre of the ellipse $\frac{(x+y-2)^2}{9}+\frac{(x-y)^2}{16}=1$ is

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8. Let 'S' be the focus and G be the point where the normal at P meets the axis of the ellipse then SG = eSP

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9. A circle of radius r is concentric with the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ Prove that slope of the common tangent of the above curves is $\sqrt{\frac{r^2-b^2}{a^2-r^2}}$

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ADDITIONAL SOLVED EXAMPLES

1. Find the equation of the ellipse whose axes are parallel to the coordinate axes having its centre at the point (2, -3) one focus at (3, -3) and one vertex at (4,-3)

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2. Find the length of focal radii drawn from the point $\left(4\sqrt{3}, 5\right)$ on the ellipse $25x^2 + 16y^2 = 1600$

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3. Find the radius of the circle passing through the foci of an ellipse $9x^2 + 16y^2 = 144$ and having least radius.

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4. A man running round a race course notes that the sum of the distances of two flag posts from him is always 10 meters and the distance between the flag posts is 8 meters. Then the area of the path he encloses (in square meters) is

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5. The point of intersection of normals to the parabola $y^2 = 4x$ at the points whose ordinates are 4 and 6 is

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6. If any two chords be drawn through two points on the major axis of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ equidistant from the centre prove that $\tan\frac{\alpha}{2}\tan\frac{\beta}{2}\tan\frac{\gamma}{2} = 1$ where $\alpha, \beta, \gamma, \delta$ are the eccentricity angles of the extremities of the chord.

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7. Prove that the chord joining points $P(\alpha)$ and $Q(\beta)$ on the ellipse subtends a right angle at the vertex A(a,0) then $\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right) = \frac{-b^2}{a^2}$

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EXERCISE 4.1(VERY SHORT ANSWER QUESTIONS)

1. Find the eccentricity of the ellipse

$(i)\frac{x^2}{16}+\frac{y^2}{9}=1$

$(ii)\frac{x^2}{64}+\frac{y^2}{36}=1$

$(iii)25x^2+4y^2=100$

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2. Find the eccentricity of the ellipse

(i) whose latus rectum is equal to half of its minor axis

(ii) whose latus rectum is equal to half of its major axis

(iii) if the major axis is three times the minor axis

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3. S and T are the foci of an ellipse and B is one end of the minor axis. IF STB is an equilateral traingle , then find the eccentricity of the ellipse.

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4. Find the equation of the ellipse whose foci are (0 ± 3) and $e = \frac{3}{4}$

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5. If P is a point on the e llip $\frac{x^2}{36} + \frac{y^2}{9} = 1$, S and S ' are the foci of the ellipse then find $SP + SP^1$

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6. If the m inor axis of an ellipse form s an equilateral triangle with one vertex of the ellipse then e =

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7. Find the length of latus rectum of $\frac{x^2}{64} + \frac{y^2}{36} = 1$

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8. Find the radius of the circle passing through the foci of an ellipse $9x^2 + 16y^2 = 144$ and having least radius.

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EXERCISE 4.1 (SHORT ANSWER QUESTIONS)

1. Find the equation of the ellipse whose focus (-1,1) $e = \frac{1}{2}$ and directrix is x-y+3=0

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2. Find the equation of the ellipse with centre (2, 1),$e = \frac{1}{3}$ one end of the major axis (2,-5).

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3. Find the equation of the ellipse in the standard form if

(i) e = $\frac{1}{2}$ and Passes through (2, 1)

(ii) it passes through the points (-2,2), (3, -1)

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4. Find the equation of the ellipse in the standard form given

(i) latus rectum = 4 and distance between foci is $4\sqrt{2}$

(ii) distance between foci is 8 and the distance between directrices is 32

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5. Find the equation of the ellipse in the form $\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$. Given the following data.

Centre(0,-3),e=$\frac{2}{3}$, semi -minor axis =5.

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6. Find the equation of the ellipse whose vertices are (-4, 1) (6, 1) and one of the focal chord is x - 2 y - 2 = 0

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7. A man running on a race course notices that the sum of the distances of the two flag posts from him is always 10m and the distance between the flag posts is 8m. Find the equation of the race course traced by the man

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EXERCISE 4.1(LONG ANSWER QUESTIONS)

1. Find the length of major axis,minor axis, latus rectum, eccentricity co-ordinates of centre, foci and the equations of directrices of the following ellipse.

$4x^2 + y^2 - 8x + 2y + 1 = 0$

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2. A line of fixed length a + b moves so that its ends are always on two fixed perpendicular straight lines. Then the locus of a point which divides this line into portions of length a and b is

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EXERCISE 4.2(VERY SHORT ANSWER QUESTIONS)

1. (i) Find the equation of the tangent and normal at (2, 1) on the ellipse $2x^2 + 3y^2 = 11$

(ii) Find the equaiton of the tangent and normal at (-1,2) on the ellipse $x^2 + 8y^2 = 33$

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2. Find the condition for the line x cos α+y sin α=p to be a tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.

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3. Find the equations of the tangents to the ellipse $2x^2+y^2=8$ which are

(i) parallel to x - 2y - 4

(ii) perpendicular to x + y + 2 = 0

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4. (i) Find the equation of director circle of $9x^2+25y^2=225$

(ii) Find the equation of auxiliary circle of $9x^2+16y^2=144$

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EXERCISE 4.2 (SHORT ANSWER QUESTIONS)

1. (i) Find the equations of the tangent and normal at the positive end of the latusrectum of the ellipse $9x^2 + 16y^2 = 144$

(ii) Find the equations of the tangent and normal to the ellipse $2x^2 + 3y^2 = 11$ at the point whose ordinate is one.

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2. Find the equations of the tangents drawn from (1 ,2) to the ellipse $3x^2 + 2(y)^2 = 5$ and also find angle between them

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3. (i) Find the equations of the tangents to $9x^2 + 16y^2 = 144$, which makes equal intercepts on the coordinate axes.

(ii) Find the value of k if 4x + y + k = 0 is a tangent to the ellipse $x^2 + 3y^2 = 3$

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4. If the normal at one end of a latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ passes through one end of the minor axis, then show that $e^4 + e^2 = 1$[e is the eccentricity of the ellipse]

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5. A circle of radius 4, is concentric with the ellipse $3x^2 + 13y^2 = 78$. Prove that a common tangent is inclined to the major axis at an angle $\frac{\pi}{4}$

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6. Show that the locus of the feet of the perpendiculars drawn from the foci to any tangent of the ellipse is the auxiliary circle

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7. Show that the point o f intersection of the tangents to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=l(a>b)$ which are inclined at an angle θ, and θ_2 with its major axis such that $\cot\theta_1,\ +\cot\theta_2,\ =k^2$ lies on the curve $k^2\left(y^2\text{~}-b^2\right)=2xy$.

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EXERCISE 4.3 (VERY SHORT ANSWER QUESTIONS)

1. If $p(\theta)$ is a point on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1(a>b)$ then find its coresponding point

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2. Find the equation of tangent at the point $\theta = \frac{\pi}{3}$ to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$

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3. Find the equation of normal to the ellipse $\frac{x^2}{16} + \frac{y^2}{9}$ = 1 at the point whose eccentric angle $\theta = \frac{\pi}{6}$

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4. The distance of a point on the ellipse $x^2 + 3y^2 = 6$ from its centre is 2. Find the eccentric angle of the point.

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ADDITIONAL EXERCISE

1. The circle on SS' as diameter intersects the ellipse in real points then its eccentricity

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2. Let S, S' are the focii and BB' be the minor axis of an ellipse. If $\angle BSS' = \theta$ then its eccentricity is

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3. Find the length of common tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the circle $x^2 + y^2 = r^2$ intercepted between the coordinate axes . where $0 < b < r < a$

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4. If the chords of contact of tangents from two points to the ellipse are a right angles, then show that $\frac{x_1x_2}{y_1y_2} = -\frac{a^4}{b^4}$

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5. Show that the locus of middle points of a focal chord of an ellipe $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{ex}{a}$

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6. The locus of mid points of the chords of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ which pass through foot of a directrix

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7. Prove that the sum of the squares of the perpendiculars on any tangent of the ellipse form the points on the minor axis is $2a^2$

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8. Find the locus of point of intersection of tangents to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ which are inclined at an angle α with each other.

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9. P and P' are corresponding points on an ellipse and its auxilliary circle. Prove that the tangents at P and P' intersect on the major axis.

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10. If any tangent to the ellipse makes intercepts of lengths p and q on the axes, prove that $\frac{a^2}{p^2}+\frac{b^2}{q^2}=1$

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11. The tangent at a point $P(a\cos\theta, b\sin\theta)$ on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ meets the auxillary circle in two points. The chord joining them subtends a right angle at the centre. Find the eccentricity of the ellipse:

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12. Find the area of the triangle formed by three points on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ whose eccentric angles are α, β and γ.

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13. If the normal at any point P on the ellipse meets the axes in G and g respectively. Find the ratio PG : Pg.

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14. Show that the area of a triangle inscribed in an ellipse bears a constant ratio to the area of the triangle formed by joining points on the auxiliary circle correspoinding to the vertices of the first triangle.

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15. The tangent at a point $P(\theta)$ to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ cuts the auxilliary circle at Q and R. If QR subtend a right angle at C (centre) then show that $e=\frac{1}{\sqrt{1+\sin^2\theta}}$

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16. If foci and the ends of the minor axis of an ellipse are the vertices of a square, then show that the e $=\frac{1}{\sqrt{2}}$

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17. Prove that the locus of an end of latusrectum of all ellipses having a given major axis is a parabola.

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18. Show that the length of common tangent to the ellipse 'x^(2)/(25)+y^(2)/(4)=1' and the circle $x^2+y^2=16$ intercepted by the co ordinate axis is $\frac{14}{\sqrt{3}}$

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19. 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 ellipse. If F_1 and F_2 are the foci of the ellipse, then show that $(PF_1-PF_2)^2=4a^2\left(1-\frac{b^2}{d^2}\right)$

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20. Find the point on the curve $4x^2+a^2y^2=4a^2, 4<a^2<8$, that is farthest from the point (0,-2).

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21. Prove that in an ellipse the perpendicular from focus upon any tangent and the line joining the centre of the ellipse to the point of contact meet on the corresponding directrix.

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22. Let P be a point on the ellipse Let the line parallel to y-axis passing through P meet the circle $x^2 + y^2 = a^2$ at the point Q such that P and Q are on the same side of x - axis. For two positive real numbers r and s, show that the locus of R on PQ such that PQ : RQ = r : s as P varies over the ellipse is an ellipse.

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23. Let P be a point on the ellipse Let the line parallel to y-axis passing through P meet the circle $x^2 + y^2 = a^2$ at the point Q such that P and Q are on the same side of x - axis. For two positive real numbers r and s, show that the locus of R on PQ such that PQ : RQ = r : s as P varies over the ellipse is an ellipse.

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24. Consider the family of circles If in the 1st quadrant, the common tangent to a circle of this family and the ellipse $4x^2 + 25y^2 = 100$ meets the co-ordinate axes at A and B, then show that the locus of mid point of AB is $4x^2 + 25y^2 = 4x^2y^2$

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25. Show that the maximum distance of centre of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ from a normal to the ellipse is (a - b).

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26. The product of the perpendiculars from the foci on any tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ is

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27. Prove that the locus of mid points of the chords $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ the tangents at the ends of which intersect on the circle $x^2+y^2=r^2$ is $r^2\left(\frac{x^2}{a^2}+\frac{y^2}{b^2}\right)^2=x^2+y^2$

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28. Prove that the locus of mid points of the chords $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ the tangents at the ends of which intersect on the circle $x^2+y^2=r^2$ is $r^2\left(\frac{x^2}{a^2}+\frac{y^2}{b^2}\right)^2=x^2+y^2$

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29. Find the shortest distance between the ellipse $x^2+2y^2=2$ and the circle $x^2+y^2-3x-2\sqrt{2}y+4=0$

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30. Given the base of the triangle and the sum of tangent of base angles as a negative constant $-k^2$, show that the locus of the vertex of the triangle is a parabola.

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31. If a circle intercepts the ellipse at four points, show that the sum of the eccentric angles of these points is an even multiple of π

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32. If a line is drawn through a point A(3,4) to cut the circle $x^2 + y^2 = 4$ at P and Q then AP .AQ=

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33. From a variable point P tangents are drawn to the ellipse $4x^2 + 9y^2 = 36$. If the chord of contact is bisected by the line x + y = 1, find the locus of P.

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34. Tangents are drawn to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = a + b$ at the points where it is cut by the line $\frac{x}{a^2}\cos\theta - \frac{y}{b^2}\sin\theta = 1$, then the point of intersection of Tangents

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EXERCISE-I

1. Focus (4, 0), e $=\frac{1}{2}$, directrix is x -16 = 0. Then equation of the ellipse is

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

B. $\frac{x^2}{64}+\frac{y^2}{32}=1$

C. $\frac{x^2}{64}+\frac{y^2}{48}=1$

D. $\frac{x^{48}}{16}+\frac{y^2}{64}=1$

Answer: C

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2. The equation of the ellipse whose foci are $(\pm 3, 0)$ and eccentricity 3/4 is

A. $\frac{x^2}{16}+\frac{y^2}{7}=1$

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

C. $\frac{x^2}{16} + \frac{y^2}{7} = 1$

D. $\frac{x^2}{7} + \frac{y^2}{16} = 1$

Answer: C

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3. If centre (1, 2), axes are parallel to co-ordinate axes, distance between the foci 8, e = $\frac{1}{\sqrt{2}}$ then equation of the ellipse is

A. $\frac{(x-1)^2}{32} + \frac{(y-2)^2}{16} = 1$

B. $\frac{(x-1)^2}{16} + \frac{(y-2)^2}{8} = 1$

C. $\frac{(x-1)^2}{64} + \frac{(y-2)^2}{8} = 1$

D. $\frac{(x-1)^2}{24} + \frac{(y-2)^2}{12} = 1$

Answer: A

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4. If vertices are (2, -2), (2, 4) and e = $\frac{1}{3}$ then equation of the ellipse is

A. $\frac{(x-2)^2}{8}+\frac{(y-1)^2}{18}=1$

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

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

D. $\frac{(x-2)^2}{9}+\frac{(y-1)^2}{8}=1$

Answer: D

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5. The centre of the ellipse $9x^2+25y^2-18x-100y-160=0$ is

A. (1,2)

B. (2,1)

C. (-1,2)

D. (-2,1)

Answer: A

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6. The centre of the ellipse $\frac{(x+y-2)^2}{9}+\frac{(x-y)^2}{16}=1$ is

A. (0,0)

B. (0,1)

C. (1,0)

D. (1,1)

Answer: D

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7. The centre of the ellipse $\frac{(x+y-3)^2}{9}+\frac{(x-y+1)^2}{16}=1$ is

A. (-1,2)

B. (1,-2)

C. (-1,-2)

D. (1,2)

Answer: D

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8. The Foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{25}-1$ are

A. (0 ± 3)

B. (0 ± 4)

C. (0 ± 5)

D. (0 ± 2)

Answer: A

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9. The length of the latusrectum $16x^2 + 25y^2 = 400$ is

A. $\frac{25}{2}$

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

C. $\frac{16}{5}$

D. $\frac{32}{5}$

Answer: D

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10. If the latus rectum of the ellipse $x^2 \tan^2 \alpha + y^2 \sec^2 \alpha = 1$ is 1/2 then $\alpha =$

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

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

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

D. $\frac{\pi}{12}$

Answer: A

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11. If PSP' is a focal chord of the ellipse $\frac{x^2}{7}+\frac{y^2}{9}=1$ then $\frac{SP.SP'}{SP+SP'}=$

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

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

C. $\frac{9}{\sqrt{7}}$

D. $\frac{7}{\sqrt{3}}$

Answer: B

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12. P is a point on the ellipse $\frac{x^2}{36}+\frac{y^2}{9}=1$; S, S^1 are the Foci of the ellipse then $SP+S^1P$ =

A. 6

B. 12

C. $6\sin 60^\circ$

D. $6\cos 60^\circ$

Answer: B

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13. The distance between the focii of the ellipse $x = 3\cos\theta, y = 4\sin\theta$ is

A. $\sqrt{7}$

B. $\sqrt{2}$

C. $2\sqrt{7}$

D. $3\sqrt{7}$

Answer: C

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14. The equation of the major axis of the ellipse $\frac{(x-1)^2}{9}+\frac{(y-6)^2}{4}=1$ is

A. y-2=0

B. x-1=0

C. y=6

D. x=5

Answer: C

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15. The equation of one of the latusrectum of $\frac{(x-3)^2}{5}+\frac{(y-5)^2}{9}=1$ is

A. y-3=0

B. x-1=0

C. y=6

D. x=5

Answer: A

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16. The eccentricity of the ellipse $\frac{x^2}{16}+\frac{y^2}{25}$ =1 is

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

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

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

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

Answer: B

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17. The eccentricity of the ellipse $\frac{(x-1)^2}{16} + \frac{(y-2)^2}{9} = 1$ is

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

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

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

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

Answer: C

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18. The eccentricity of the ellipse $9x^2 + 25y^2 - 18x - 100y + 20 = 0$ is

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

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

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

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

Answer: B

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19. If a line $\frac{x}{8} + \frac{y}{5} = 1$ meets the ellipse on x - axis and the line $\frac{x}{3} + \frac{y}{4} = 1$ meets the ellipse on y - axis then its eccentricity

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

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

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

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

Answer: C

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20. If the length of the major axis is n times the minor axis of the ellipse, then ecccentricity is

A. $\frac{\sqrt{n-1}}{n}$

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

C. $\frac{\sqrt{n^2-1}}{n^2}$

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

Answer: D

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21. The distance between the foci of an ellipse is equal to half of its minor axis then eccentricity is

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

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

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

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

Answer: B

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22. If the minor axis of an ellipse subtends an angle 60° at each focus then e =

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

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

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

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

Answer: A

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23. The eccentricity of an ellipse i s $\frac{\sqrt{3}}{2}$ its length of latus rectum is

A. $\frac{1}{2}$ (length of major axis)

B. $\frac{1}{3}$ (length of major axis)

C. $\frac{1}{4}$ (length of major axis)

D. $\frac{2}{3}$ (length of major axis)

Answer: C

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24. If e_1 and e_2 are the eccentricites of $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and $\frac{x^2}{b^2}+\frac{y^2}{a^2}=1$ respectively then

A. $e_1=e_2$

B. $e_1e_2=1$

C. $\frac{1}{e_1^2}+\frac{1}{e_2^2}=1$

D. $\frac{1}{e_1}+\frac{1}{e_2}=1$

Answer: c

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25. The equation of the tangent to the ellipse $9x^2 + 16y^2 = 144$ at the positive end of the latusrectum is

A. 3x+4y=12

B. 4x-3y=12

C. $\sqrt{7}x + 4y = 16$

D. $3x + \sqrt{7}y = 16$

Answer: C

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26. If x -y+ k = 0 is a tan gen t to the ellip se $9x^2 + 16y^2 = 144$ then k =

A. 2

B. 3

C. 4

D. 5

Answer: D

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

A. $\pm\sqrt{45}$

B. $\pm\sqrt{60}$

C. $\pm\sqrt{65}$

D. $\pm\sqrt{72}$

Answer: C

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28. The equation of tangent to the ellipse $2x^2 + 3y^2 = 6$ which make an angle 30° with the major axis is

A. $x - \sqrt{3}y \pm 3 = 0$

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

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

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

Answer: A

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29. The equations of the tangents to the ellipse $4x^2 + 3y^2 = 5$ which are perpendicular to the line 3x-y+7 = 0 are

A. $2x - 2y \pm \sqrt{55} = 0$

B. $2x - 12y \pm \sqrt{55}/2 = 0$

C. $2x + 6y \pm \sqrt{65} = 0$

D. $2x + 2y \pm \sqrt{15} = 0$

Answer: C

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30. The point of contact 8x-9y+5 = 0 with the ellipse $4x^2 + 9y^2 = 1$ is

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: C

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31. The number of tangents to $\frac{x^2}{9} + \frac{y^2}{4} = 1$ through (3,2) is

A. 0

B. 1

C. 2

D. 3

Answer: C

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32. The sum of the slopes of the tangents to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ drawn from the point (6, -2) is

A. 0

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

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

D. $-\frac{8}{9}$

Answer: D

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33. The locus of the point of intersection of the perpendicular tangents to the ellipse $2x^2 + 3y^2 = 6$ is

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

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

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

D. $x^2 + y^2 = 43$

Answer: C

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34. Angle between the tangents drawn from the point (5,4) to the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is

A. 45°

B. 60°

C. 90°

D. 120°

Answer: C

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35. The tangents drawn from the point P to the ellipse $5x^2 + 4y^2 = 20$ are mutually perpendicular then P =

A. $(\sqrt{5}, \sqrt{8})$

B. $(\sqrt{8}, 1)$

C. $(\sqrt{3}, -1)$

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

Answer: B

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36. The equation to the auxiliary circle of $\frac{x^2}{7} + \frac{y^2}{5} = 1$ is

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

B. $x^2 + y^2 = 7$

C. $x^2 + y^2 = 18$

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

Answer: B

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37. The tangent at any point P on the ellipse meets the tangents at the vertices A & A^1 of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at L and M respectively. a b Then AL. A^1M =

A. a^2

B. b^2

C. a^2+b^2

D. ab

Answer: B

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38. The equation of the normal to the ellipse $x^2+3y^2=144$ at the positive end of the latusrectum is

A. $\sqrt{3x} - \sqrt{2y} = 8\sqrt{2}$

B. $\sqrt{3x} + \sqrt{2y} = 8\sqrt{2}$

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

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

Answer: A

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39. The equation of the chord of the ellipse $4x^2 + 9y^2 = 36$ having (3, 2) as mid pt.is

A. 2x+3y=6

B. 2x+3y=12

C. 3x+y=11

D. 3x+2y=13

Answer: B

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40. If $p(\theta)$ is a point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1(a > b)$ then find its coresponding point

A. $(a\cos\theta, b\sin\theta)$

B. $(a\cos\theta, -b\sin\theta)$

C. $(a\cos\theta, a\sin\theta)$

D. $(-a\cos\theta, a\sin\theta)$

Answer: C

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41. The dist. of a point P on the ellipse $\frac{x^2}{12}+\frac{y^2}{4}=1$ from centre is $\sqrt{6}$ then the eccentric angle of Pis

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

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

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

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

Answer: D

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42. The eccentric angles of the ends of L.R. of the ellipse $\left(\frac{x^2}{a^2}\right)+\left(\frac{y^2}{b^2}\right)=1$ is

A. $\tan A^{-1}\left(\pm\frac{b}{ae}\right)$

B. $\sin^{-1}\left(\pm\frac{b}{ae}\right)$

C. $\cos^{-1}\left(\pm\frac{b}{ae}\right)$

D. $\sec^{-1}\left(\pm\frac{b}{ae}\right)$

Answer: A

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43. $P\left(\frac{\pi}{6}\right)$ is a point on the ellipse $\frac{x^2}{36}+\frac{y^2}{9}=1S$, S^1 are foci of ellipse then $\left|SP-S^1P\right|=$

A. $6\sqrt{3}$

B. 9

C. $9\sqrt{3}$

D. 27

Answer: B

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44. The equation of the tangent at the point $\theta = \frac{\pi}{3}$ to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is

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

B. $2x + 3\sqrt{3y} = 12$

C. $3x - 4y + 12\sqrt{2}$

D. $x + y + 12 = 12\sqrt{2} = 0$

Answer: B

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45. $\frac{x}{a}+\frac{y}{b}=\sqrt{2}$ touches the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ then the eccentric angle of P is

A. 0°

B. 90°

C. 45°

D. 60°

Answer: C

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46. The equation of the normal to the ellipse $\frac{x^2}{4}+\frac{y^2}{2}=1$ at the point whose eccentric angle is $\frac{\pi}{4}$ is

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

B. $\sqrt{2}x - y = 1$

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

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

Answer: B

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47. If P is a point on the ellipse of eccentricity e and A, A 1 are the vertices and S, S' are the foci then area of SPS' : area of APA' =

A. e^3

B. e^2

C. e

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

Answer: C

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48. P is a variable point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with AA as the major axis. Then the maximum value of the area of $\triangle$ APA' is

A. ab

B. 2ab

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

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

Answer: A

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49. If $\sqrt{3}bx + ay = 2ab$ is a tangent to the ellipse then ecentric angle θ is

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

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

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

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

Answer: B

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50. The locus of mid points of the chords of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ which pass through foot of a directrix

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

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

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

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

Answer: A

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51.

List$-I$	List$-II$
The number of rational points on the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$	4
The number of integral points on the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$	2
The number of integral points on the ellipse $\frac{x^2}{3}+\frac{y^2}{1}=1$	∞

A. 1 2 3

B. 3 1 2

C. 3 2 1

D. 2 3 1

Answer: B

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

A. 6

B. 4

C. 3

D. 2

Answer: B

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EXERCISE-II

1. Focus (3, 0), e $=\frac{3}{5}$, d irectrix 3x-25= 0, equation of the ellipse is

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

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

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

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

Answer: B

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2. Foci are (0, $\pm$ 3), e = $\frac{3}{4}$, equation of the ellipse is

A. $\frac{x^2}{7}+\frac{y^2}{16}=1$

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

C. $\frac{x^2}{9} + \frac{y^2}{18} = 1$

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

Answer: A

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3. The eccentricity of an ellipse, with its centre at the origin, is 1/2.

If one of the directrices is x = 4, then the equation of the ellipse is

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

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

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

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

Answer: B

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

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

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

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

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

Answer: C

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5. Focus (-1, 1), e = $\frac{1}{2}$ directirx i s x - y + 3 = 0 eq. of the ellipse is

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

B. $7x^2 + 2xy + 7y^2 + 10x - 10y + 7 = 0$

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

D. $9x^2 + 2xy + 9y^2 + 15x - 10y + 10 = 0$

Answer: B

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6. The equation of the ellipse referred to its axes as coordinate axes, which passes through the point (2, 2) and (1, 4) is

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

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

C. $4x^2 + y^2 = 20$

D. $4x^2 + y^2 = 24$

Answer: C

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7. The equation of the ellipse with its focus at (6, 2), centre at (1, 2) and which passes through the point (4, 6) is

A. $\frac{(x-1)^2}{25} + \frac{(y-2)^2}{16} = 1$

B. $\frac{(x-1)^2}{25} + \frac{(y-2)^2}{16} = 1$

C. $\frac{(x-1)^2}{45} + \frac{(y-2)^2}{20} = 1$

D. $\frac{(x-1)^2}{45} + \frac{(y-2)^2}{16} = 1$

Answer: C

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8. Axes are coordinate axes, A and L are the ends of major axis and latusrectum. Area of 1 $\triangle$ OAL = 8 sq. units, e = $\frac{1}{\sqrt{2}}$ then equation of the ellipse is

A. $\frac{x^2}{16} + \frac{y^2}{8} = 1$

B. $\frac{x^2}{32} + \frac{y^2}{16} = 1$

C. $\frac{x^2}{64} + \frac{y^2}{32} = 1$

D. $\frac{x^2}{8} + \frac{y^2}{4} = 1$

Answer: B

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9. If vertices of an ellipse are (-4, 1), (6,1) and x - 2y = 2 is a focal chord then the equation of the ellipse is

A. $\frac{(x-1)^2}{16}+\frac{(y-1)^2}{25}=1$

B. $\frac{(x-1)^2}{25}+\frac{(y-1)^2}{9}=1$

C. $\frac{(x-1)^2}{16}+\frac{(y-1)^2}{9}=1$

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

Answer: B

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10. Foci of an ellipse are at S(l,7),S'(l,-3) - The point P is on the ellipse such that SP = 7, S'P = 5. Then the equation of the ellipse is

A. $\frac{(x-1)^2}{11}+\frac{(y+1)^2}{36}=1$

B. $\frac{(x-1)^2}{36}+\frac{(y-2)^2}{11}=1$

C. $\frac{(x-1)^2}{36}+\frac{(y+1)^2}{1}=1$

D. $\frac{(x-1)^2}{11}+\frac{(y+1)^2}{6}=1$

Answer: B

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11. Find the equation of the ellise in the standard form whose distance between foci is 2 and the length of latus rectum is $\frac{15}{2}$.

A. A,B,C,D

B. D,C,B,A

C. C,A,D,B

D. C,A,B,D

Answer: D

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12. The equation $\frac{x^2}{10-k}+\frac{y^2}{k-4}=1$ represents an ellipse if

A. $k<4$

B. $k>10$

C. $4<k<10$

D. $5\in(4,7)\mu(7,10)$

Answer: C

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

$listI$	$listII$
directrix corresponding to the focus$(-3, 0)$	$y = 4$
tangent at the vertex$(0, 4)$	$3x = 25$
latus rectum through$(3, 0)$	$x = 3$
	$y + 4 = 0$
	$x + 3 = 0$
	$3x + 25 = 0$

A. b a e

B. f a c

C. b d c

D. f a e

Answer: B

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14. The foci of the ellipse $9x^2 + 25y^2 - 36x + 50y - 164 = 0$ are

A. (6,1)(2,-1)

B. (6,-1)(-2,-1)

C. (-6,1)(-4,-1)

D. (6,1)(2,1)

Answer: B

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15. The length of the latusrectum of $9x^2 + 25y^2 - 90x - 150y + 225 = 0$ is

A. $\frac{9}{5}$

B. $\frac{18}{5}$

C. $\frac{18}{25}$

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

Answer: B

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16. Equations of the latus recta of the ellipse $9x^2 + 4y^2 - 18x - 8y - 23 = 0$ are

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

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

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

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

Answer: C

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17. If the equation $8\left[(x+1)^2+(y-1)^2\right]=(x-y+3)^2$ represents a conic. The equation of its latusrectum is

A. x-y+3=0

B. x-y+2=0

C. x+y=0

D. x+y=0

Answer: B

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18. If A = (1,2),B = (3 ,-2) and P moves in the plane such that AP + BP = 7 ,then the locus of P has two axes of symmetry. Their equations are :

A. x-2y+3=0, 2x+y=4

B. 2x+y=4, x-2y=2

C. x-2y=2, x-y+1=0

D. x-2y=7, 2x+y=4

Answer: B

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19. Match the following from List-I to List-II

$list - I$	$list - II$
major axis of $3(x - 1^2) + 4(y + 2^2) = 12$	$y - \sqrt{2} = 0$
minor axis of $2(x + 1^2) + 3(y - 1^2) = 6$	$x - 2\sqrt{2} = 0$
directirx of $x^2 + 2y^2 = 4$	$y + 2 = 0$
latus rectum of $2x^2 + y^2 = 4$	$x + 1 = 0$

A. 3124

B. 3214

C. 4132

D. 3421

Answer: D

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20. $(x-2)^2+(y+3)^2$ = 16 touching the ellipse $\frac{(x-2)^2}{p^2}+\frac{(y+3)^2}{q^2}=1$ from inside if (2,-6) is one focus of the ellipse then (p,q)=

A. 4,5

B. 5,4

C. 5,3

D. 3,5

Answer: A

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

A. 4

B. 3

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

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

Answer: A

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22. S and S^1 foci of an ellipse. B is one end of the minor axis. If I. SBS^1 is a right angled isoscles triangle, then e =

A. parallelgram

B. rhombus

C. square

D. rectangle

Answer: C

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23. 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 semi major axis is

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

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

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

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

Answer: A

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24. The eccentricity of the ellipse $x^2 + 4y^2 + 2x + 16y + 13 = 0$ is

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

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

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

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

Answer: A

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25. LL^1 is the latus rectum of an ellipse and $\triangle S^1LL^1$ is an equilateral triangle. Then e =

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

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

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

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

Answer: B

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26. The area of an ellipse is 8π sq. units dist. between the foci is $4\sqrt{3}$ then e =

A. sin 30°

B. sin 45°

C. sin 60°

D. sin 75°

Answer: C

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27. Statement-I : If a latusrectum of an ellipse subtends angle 60° at the farthest vertex then eccentricity is $1 - \frac{1}{\sqrt{3}}$ Statement-II : If a latusrectum subtends 60° at the centre of the ellipse then ecentricity is $\frac{\sqrt{13} - 1}{2\sqrt{3}}$

A. only I

B. only II

C. both I & II

D. neither I nor II

Answer: A

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28. A circle is described with minor axis of an ellipse as a diameter.

If the foci lie on the circle, the eccentricity of the ellipse is

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

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

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

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

Answer: D

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29. The eccentricity of the ellipse given by the locus of the point P(x, y) satisfying the equation $\sqrt{(x-2)^2+(y-1)^2}+\sqrt{(x+2)^2+(y-1)^2}=8$ is

A. $\frac{1}{8}$

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

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

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

Answer: C

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30. If (5, 12) and (24, 7) are the focii of conic passing through (0, 0), then the eccentricity of the ellipse is

A. $\frac{\sqrt{386}}{38}$

B. $\frac{\sqrt{386}}{45}$

C. $\frac{\sqrt{386}}{25}$

D. $\frac{\sqrt{386}}{20}$

Answer: A

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31. If S and S^1 are the foci BB^1 is the minor axis such that $Ang(SBS^1) = \sin^{-1}\left(\frac{3}{5}\right)$ then e =

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

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

C. $\frac{1}{\sqrt{10}}$

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

Answer: C

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

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

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

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

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

Answer: C

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33. The eccentricity of the ellipse $9x^2 + 5y^2 - 18x - 2y - 16 = 0$ is

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

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

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

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

Answer: B

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34. In an ellipse the distance between the foci is 6 and it's minor axis is 8. Then its eccentricity is

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

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

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

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

Answer: A

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35. S and S^1 foci of an ellipse. B is one end of the minor axis. If I. SBS^1 is a right angled isoscles triangle, then e =

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

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

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

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

Answer: A

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36. The slopes of the tangents drawn from (4, 1) to the ellipse $x^2 + 2y^2 = 6$ are

A. $1, 1/5$

B. $-1, \ -1/5$

C. $-1, 1/5$

D. $1, \ -1/5$

Answer: D

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37. Statement-I : The sum of the slopes of the tangents drawn from (5,4) to $\frac{x^2}{16}+\frac{y^2}{12}=1$ is $\frac{40}{9}$

Statement-II :The product of the slopes in the $\frac{4}{9}$ Which of the above statements is true

A. only I

B. only II

C. both I & II

D. neither I nor II

Answer: C

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38. C is the centre of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and L is an end of a latusrectum. If the normal at L meets the major axis at G then

CG =

A. ae

B. ae^2

C. ae^3

D. a^2e^2

Answer: C

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39. Statement-I : The distance of the normal to $x^2 + 2y^2 = 5$ at $(1, \sqrt{2})$ from origin is $\frac{1}{3}\sqrt{2}$.

Statement-II : The product of the perpendiculars from the foci of the ellipse $\frac{x^2}{7} + \frac{y^2}{4} = 1$ to any tangent is 7.

Statement-III: The distance between the foci of $\frac{x^2}{25} + \frac{y^2}{36} = 1$ is

$2\sqrt{11}$.

The Statements that are correct are :

A. both I & III

B. both II & III

C. both I & II

D. neither I nor II

Answer: A

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40. The product of the perpendicular distances drawn from the foci to any tangent of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is $(>b)$

A. a^2

B. b^2

C. $a^2 + b^2$

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

Answer: B

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41. The angle between the tangents drawn from the point (1,2) to the ellipse $3x^2 + 2y^2 - 5$ is

A. $\tan^{-1}\left(\frac{12\sqrt{5}}{5}\right)$

B. $\tan^{-1}\left(\frac{16\sqrt{5}}{5}\right)$

C. $\tan^{-1}\left(\frac{3\sqrt{5}}{5}\right)$

D. $\tan^{-1}\left(\frac{12}{5}\right)$

Answer: A

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42. If the chords of contact of $P(x_1, y_1)$ and $Q(x_2 \_ , y_2)$ w.r.t the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ are right angle then $\frac{x_1 x_2}{y_1 y_2}$ =

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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43. The mid point of the chord 2x+5y=12 of the ellipse $4x^2 + 5y^2 = 20$ is

A. 6,0

B. 1,2

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

D. 11,2

Answer: B

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

A. 0,1

B. 1,2

C. 1,0

D. 2,1

Answer: B

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

A. x-6y=26

B. x+6y=26

C. 6x-y=26

D. 6x+y=26

Answer: A

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46. The ratio of the ordinates of a point and its .corresponding point is $\frac{2\sqrt{2}}{3}$ then eccentricity is

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

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

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

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

Answer: A

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47. If the extremities of a focal chord are $\frac{5\pi}{12}$ and $\frac{\pi}{12}$ then e =

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

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

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

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

Answer: B

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48. If α, β are the ends of a focal chord of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ then its eccentricity e is

A. $\frac{1 + \frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2}}{1 - \frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2}}$

B. $\frac{1 - \frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2}}{1 + \frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2}}$

C. $\frac{\frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2} + 1}{\frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2} - 1}$

D. $\frac{\frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2} - 1}{\frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2} + 1}$

Answer: A

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49. If the chord joining two points whose eccentric angles are α and β cut the major axis of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at a distance from the centre then $\frac{\tan(\alpha)}{2}.\frac{\tan(\beta)}{2}$ =

A. $\frac{c+a}{c-a}$

B. $\frac{c-a}{c+a}$

C. $\frac{c}{a}$

D. c+a

Answer: B

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50. If $\tan\theta_1\tan\theta_2 = -\frac{a^2}{b^2}$ then the chord joining two points θ_1 and θ_2 on the ellipse will subtend a right angle at

A. focus

B. centre

C. end of major axis

D. end of minor axis

Answer: B

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51. The tangent at 'p' on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ cuts the major axis in T and PN is the perpendicular to the x-axis, C being centre then CN.CT =

A. a

B. a^2

C. b

D. b^2

Answer: B

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52. P(θ) and $D\left(\theta + \frac{\pi}{2}\right)$ are the points on the ellipse with centre C then $CP^2 + CD^2$ =

A. ab

B. a+b

C. $a^2 - b^2$

D. $a^2 + b^2$

Answer: D

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53. The area of the parallelogram formed by the tangents at the points whose eccentric angles are $\theta, \theta + \frac{\pi}{2}, \theta + \pi, \theta + \frac{3\pi}{2}$ on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

A. ab

B. 2ab

C. 3ab

D. 4ab

Answer: D

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54. The area of the parallelogram formed by the tangents at the points whose eccentric angles are $\theta, \theta + \frac{\pi}{2}, \theta + \pi, \theta + \frac{3\pi}{2}$ on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

A. ab

B. 2ab

C. 3ab

D. ab

Answer: B

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55. If PSQ is a focal chord then match the ellipse with the value of $\frac{1}{SP} + \frac{1}{SQ}$ with the value of

A. 2341

B. 3241

C. 2314

D. 3214

Answer: A

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56. A man running round a race course note that the sum of the distances of two flag posts from him is 8 meters. The area of the path he encloses in square meters if the d is t a n c e between the flag posts is 4 is

A. 15π

B. 12π

C. 18π

D. $8\sqrt{3}\pi$

Answer: D

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57. The locus of point of intersection of lines $\frac{xt}{a} - \frac{y}{b} + t = 0$ and $\frac{x}{at} + \frac{y}{b} = \frac{1}{t}$

A. striaght line

B. circle

C. parabola

D. an ellipse

Answer: D

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58. A line of fixed length a + b moves so that its ends are always on two fixed perpendicular straight lines. Then the locus of a point which divides this line into portions of length a and b is

A. an ellipse

B. a parabola

C. a straight line

D. a hyperbola

Answer: A

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59. Tangents to the ellipse $x^2/a^2 + y^2/b^2 = 1$ make angles θ_1, θ_2 with the major axis. The equation of the locus of their point of intersection when $\tan(\theta_1 + \theta_2) = k$ is

A. $\frac{k}{2}xy$

B. $\frac{2}{k}xy$

C. $\frac{xy}{k}$

D. kxy

Answer: B

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60. Locus of the point of intersection of the tangents at the points with eccentric angle θ and $\frac{\pi}{2}+\theta$ is

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

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

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

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

Answer: C

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61. The locus of the mid point of the portion of a tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ included between the coordinate axes is

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

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

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

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

Answer: D

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62. The locus of mid points of the chords of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ which pass through foot of a directrix

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

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

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

D. $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{ex}{a}$

Answer: A

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63. If S and S'' are the foci of the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ and if PSP' is a focal chord with SP = 8 then SS'' =

A. $4+S^!P$

B. $S^{!}P-1$

C. $4+SP$

D. $SP-1$

Answer: A

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64. The maximum number of normals that can be drawn from any point to an ellipse, in general, is

A. 2

B. 3

C. 1

D. 4

Answer: D

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65. The curve represented by x=2 $(\cos t + \sin t), y = 5(\cos t - \sin t)$is

A. acircle

B. a parabola

C. an ellipse

D. hyperbola

Answer: C

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66. The sides of the rectangle of greatest area that can be inscribed in the ellipse $x^2 + 4y^2 = 64$ are

A. $6\sqrt{2}, 4\sqrt{2}$

B. $8\sqrt{2}, 4\sqrt{2}$

C. $8\sqrt{2}, 8\sqrt{2}$

D. $16\sqrt{2}, 4\sqrt{2}$

Answer: B

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67. If tangents are drawn from any point on the circle $x^2 + y^2 = 25$ to the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ the angle between the tangents is

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

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

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

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

Answer: D

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68. An ellipse passing through $\left(4\sqrt{2}, 2\sqrt{6}\right)$ foci at (-4,0) and (4,0).

Its eccentricity is

A. $\sqrt{2}$

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

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

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

Answer: B

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PRACTICE EXERCISE

1. If length of the major axis is 8 and e = $\frac{1}{\sqrt{2}}$ Axes are co-ordinate axes then equation of the ellipse is

A. $\frac{x^2}{12} + \frac{y^2}{4} = 1$

B. $\frac{x^2}{16} + \frac{y^2}{8} = 1$

C. $\frac{x^2}{24} + \frac{y^2}{16} = 1$

D. $\frac{x^2}{32} + \frac{y^2}{24} = 1$

Answer: B

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2. The equation of the ellipse whose vertices are (2, 5), (2, -1) and eccentricity $\frac{\sqrt{5}}{3}$ is

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

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

C. $\frac{(x+2)^2}{16}+\frac{(y-2)^2}{36}=1$

D. $\frac{(x+2)^2}{36}+\frac{(y+3)^2}{16}=1$

Answer: A

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3. The equation of the ellipse whose focus is (2, 4), centre is (3, 4) and eccentricity is 1/2 is

A. $\frac{(x-3)^2}{4}+\frac{(y-4)^2}{3}=1$

B. $\frac{(x-3)^2}{6}+\frac{(y-4)^2}{8}=1$

C. $\frac{(x+3)^2}{6}+\frac{(y+4)^2}{8}=1$

D. $\frac{(x+3)^2}{8}+\frac{(y+4)^2}{6}=1$

Answer: A

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4. The equation of the ellipse whose centre is (5, 2) vertex is (9, 2), the length of the major axis is 8 and minor axis 6 is

A. $\frac{(x+5)^2}{26}+\frac{(y+2)^2}{19}=1$

B. $\frac{(x-5)^2}{16}+\frac{(y-2)^2}{9}=1$

C. $\frac{(x-5)^2}{16}+\frac{(y+2)^2}{9}=1$

D. $\frac{(x-5)^2}{9}+\frac{(y-2)^2}{16}=1$

Answer: B

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5. Axes are co-ordinate axes, the ellipse passes through the points where the straight line $\frac{x}{4}+\frac{y}{3}=1$ meets the cood axes. Then equation of the ellipse is

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

B. $\frac{x^2}{64}+\frac{y^2}{36}=1$

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

D. $\frac{x^2}{8}+\frac{y^2}{6}=1$

Answer: A

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6. Axes are co-ordinate axes, A and B are ends of major axes and minor axis, area of $\triangle$ OAB is 16 sq units if e=$\frac{\sqrt{3}}{2}$ then equation of the ellipse is

A. $\frac{x^2}{32}+\frac{y^2}{8}=1$

B. $\frac{x^2}{64}+\frac{y^2}{16}=1$

C. $\frac{x^2}{64}+\frac{y^2}{8}=1$

D. $\frac{x^2}{64}+\frac{y^2}{32}=1$

Answer: B

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7. The axis of the ellipse are coordinate axes. It passes through the pts P(2, 7), 2(4, 3). The equation of the ellipse is

A. $10x^2+7y^2=373$

B. $10x^2 + 5y^2 = 187$

C. $10x^2 + 3y^2 = 187$

D. $7x^2 + 10y^2 = 518$

Answer: C

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8. Latus Rectum is 4 and $e = \frac{1}{\sqrt{2}}$ axes are coordinate axes, eq. of the ellipse

A. $\frac{x^2}{4} + \frac{y^2}{8} = 1$

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

C. $\frac{x^2}{16} + \frac{y^2}{8} = 1$

D. $\frac{x^2}{16} + \frac{y^2}{4} = 1$

Answer: C

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9. The equation of the ellipse with its axes as the coordinate axes and whose latus rectum is 10 and distance between the foci = minor axis is

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

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

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

D. $x^2 + 2y^2 = 100$

Answer: D

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10. The centre of a ellipse where axes is parllel to co-ordinate axes is (2, -1) and the semi axes are $\frac{\sqrt{3}}{2}, \frac{1}{2}$ The equation of the ellipse is

A. $12x^2 + 4y^2 - 16y + 24x + 25 = 0$

B. $12y^2 + 4x^2 - 16x + 24y + 25 = 0$

C. $12y^2 + 4x^2 - 16y + 24yx + 25 = 0$

D. $12x^2 + 4y^2 - 16y + 24y + 25 = 0$

Answer: B

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11. The equation of the ellipse whose vertices are (-4, 1), (6, 1) and one laturs rectum is x - 4 = 0 is

A. $\frac{(x-1)^2}{25} + \frac{(y-1)^2}{16} = 1$

B. $\frac{(x-1)^2}{16}+\frac{(y-1)^2}{25}=1$

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

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

Answer: A

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12. If the equation $\frac{x^2}{9-k}+\frac{y^2}{5-k}=1$ represents an ellipse then

A. $k \in (5, 9)$

B. $k \in [5, 9]$

C. $k < 5$

D. $k > 5$

Answer: C

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13. The centre of the ellipse $4x^2 + 9y^2 - 24x + 36y - 72 = 0$ is

A. 2,-1

B. 3,5

C. 3,-2

D. 5,3

Answer: C

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14. The foci of the ellipse $36x^2 + 9y^2 = 324$ are

A. $0, \pm 3\sqrt{3}$

B. $0, \pm \sqrt{3}$

C. $0, \pm 4\sqrt{3}$

D. $0, \pm 5\sqrt{3}$

Answer: A

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

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

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

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

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

Answer: B

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16. The length of the latusrectum of $\frac{(x-3)^2}{16}+\frac{(y-2)^2}{36}=1$ is

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

B. $\frac{8}{9}$

C. $\frac{32}{3}$

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

Answer: A

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17. The equation of the minor axis of the ellipse $\frac{(x-1)^2}{9}+\frac{(y-6)^2}{4}=1$ is

A. y-2=0

B. x-1=0

C. y=6

D. x=5

Answer: C

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18. The equations of the directrices of the ellipse $9x^2+25y^2=225$ are

A. $4x=\pm 5$

B. $16x = \pm 25$

C. $4x = \pm 25$

D. $3x = \pm 25$

Answer: C

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19. The vertices of the ellipse $9x^2 + 25y^2 - 90x - 150y + 225 = 0$ are

A. (1,3),(9,3)

B. (2,3),(7,3)

C. (3,3),(6,3)

D. (0,3),(10,3)

Answer: A

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20. The foci of the ellipse $9x^2 + 5(y^2 - 10y + 25) = 45$ are

A. (-2,5),(2,5)

B. (0,3),(0,7)

C. (0,1),(0,9)

D. $(\pm 4, 5)$

Answer: B

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21. The equation of the major axis of $25x^2 + 16y^2 - 100x - 96y - 156 = 0$ is

A. x-4=0

B. x-2=0

C. y-3=0

D. y-6=0

Answer: B

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22. The equations of the latus recta of the ellipse $9x^2 + 25y^2 - 36x + 50y - 164 = 0$ are

A. x-4=0,x+2=0

B. x-6=0,x+2=0

C. x-6=0,x-2=0

D. x+4=0,x+5=0

Answer: B

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23. The equations of the directrices of $16x^2 + 25y^2 - 96x - 100y - 156 = 0$ are

A. $9(x - 3) = \pm 25$

B. $3(x - 3) = \pm 16$

C. $3(y - 2) = \pm 25$

D. $3(x - 3) = \pm 25$

Answer: D

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24. The asending order of the eccentricities l_1, l_2, l_3 of the conics $12x^2 + 3y^2 = 15, x^2 + 2y^2 = 6, 4(x-1)^2 + 3(y+2)^2 = 12$

A. l_1, l_2, l_3

B. l_3, l_2, l_1

C. l_3, l_1, l_2

D. l_2, l_1, l_3

Answer: B

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25. Let P be a point on an ellipse whose parameter is $\frac{\pi}{3}$. The sum and differences of the focal distances of P is 8 and 3 then the eccentricity of the ellipse is

A. A,B,C,D

B. D,B,C,A

C. A,C,B,D

D. A,D,C,B

Answer: A

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26. Match the eccentricities of the ellipses

List-I	List-II
A) $\frac{x^2}{9}+\frac{y^2}{16}=1$	1) $\sqrt{\frac{7}{10}}$
B) $\frac{x^2}{25}+\frac{y^2}{9}=1$	2) $\frac{1}{2}\sqrt{3}$
C) $3(x-1)^2+12(y-1)^2=36$	3) $\frac{4}{5}$
D) $3x^2+10y^2=30$	4) $\frac{1}{4}\sqrt{7}$

The correct Matching is

A. 3124

B. 3214

C. 4132

D. 4321

Answer: D

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27. Assertion (A) : the sum and product of the slopes of the tangents to the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ drawn from the points (6,-2) are $-\frac{8}{9}$,1. Reason(R): if m_1, m_2 are the slopes of the tangents through (x_1, y_1) of the ellipse, then $m_1+m_2=\frac{2x_1.\ y_1}{x_1^2-a^2}\ m_1.\ m_2=\frac{y_1^2-b^2}{x_1^2-a^2}$

A. A true, R true & R is correct exp. of A

B. A true, R true & R is not correct explanation of A

C. A true, R false

D. A false, R true

Answer: D

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28. If the latusrectum of an ellipse is half of its major axis then e is

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

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

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

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

Answer: A

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29. If the latus rectum of an ellipse is half of its minor axis then e =

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

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

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

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

Answer: B

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30. The distance between the directrix is equal to 8 times the distance between the foci then e =

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

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

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

D. $\frac{1}{8}$

Answer: B

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31. If the m inor axis of an ellipse form s an equilateral triangle with one vertex of the ellipse then e =

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

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

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

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

Answer: B

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32. Let S, S' are the focii and BB' be the minor axis of an ellipse. If $\angle BSS' = \theta$ then its eccentricity is

A. $\tan\theta$

B. $\sin\theta$

C. $\cos\theta$

D. $\cot\theta$

Answer: C

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33. The length of the latus rectum of an ellipse is 4. The focus and its corresponding directrix are (1, -2) and 3x + 4y - 15 = 0 then the eccentricity of the ellipse is

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

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

C. C) $\frac{1}{4}$

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

Answer: A

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34. Let P be a point on an ellipse whose parameter is $\frac{\pi}{3}$. The sum and differences of the focal distances of P is 8 and 3 then the eccentricity of the ellipse is

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

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

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

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

Answer: C

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35. The latus rectum LL' subtends a right angle at the centre of the ellipse, then its eccentricity is

A. $\frac{\sqrt{3}+1}{2}$

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

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

D. $\frac{\sqrt{5}-1}{2}$

Answer: D

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36. If the latus rectum of a hyperola forms an equilateral triangle with the centre of the hyperbola, then its eccentricity is

A. $\frac{\sqrt{3}+1}{2\sqrt{3}}$

B. $\frac{\sqrt{13}-1}{2\sqrt{3}}$

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

D. $\frac{\sqrt{13}+1}{2}$

Answer: B

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37. Area of the quadrilateral formed by the extremities of major axis and minor axis is $8\sqrt{3}$. The distance between foci is $4\sqrt{2}$. Then eccentricity of the ellipse is

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

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

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

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

Answer: C

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38. If $x + ky - 5 = 0$ is a tangent to the ellipse $4x^2 + 9y^2 = 20$ then k =

A. 3

B. -3

C. ± 3

D. ± 4

Answer: C

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39. The equations of the tangents to the ellipse $3x^2 + 4y^2 = 12$ which are parallel to the line $2x - y + 5 = 0$ is

A. $6x - 2y \pm \sqrt{155/3} = 0$

B. $2x - y \pm \sqrt{19} = 0$

C. $16x + 22y \pm \sqrt{155/3} = 0$

D. $2x + 2y \pm \sqrt{39} = 1$

Answer: B

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40. The point of contact $4x - 5y + 25 = 0$ with the ellipse $9x^2 + 25y^2 = 225$ is

A. $\left(-4, \frac{9}{5}\right)$

B. $\left(-4, \frac{3}{5}\right)$

C. $(4, -3)$

D. $(-5, 2)$

Answer: A

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41. The number of tangents to $\frac{x^2}{25} + \frac{y^2}{9} = 1$ through (1,1) is

A. 0

B. 1

C. 2

D. 3

Answer: A

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42. The product of the slopes of the tangents to the ellipse $2x^2 + 3y^2 = 6$ drawn from the point (1, 2) is

A. 1

B. 2

C. -1

D. -2

Answer: C

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43. The radius of the director circle of $16x^2 + 9y^2 = 144$ is

A. 3

B. 4

C. 5

D. 25

Answer: C

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44. The quadratic equation whose one root is $\frac{3+\sqrt{5}}{2-\sqrt{5}}$ is

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

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

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

D. $\frac{\tan^{-1}\sqrt{28}}{5}$

Answer: C

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45. The equation to the auxiliary circle of $\frac{x^2}{12} + \frac{y^2}{18} = 1$ is

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

B. $x^2 + y^2 = 18$

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

D. $x^2 + y^2 = 30$

Answer: B

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46. The equation of the normal to the ellipse $\frac{x^2}{4} + \frac{y^2}{1} = 1$ at (2, -1) is

A. x-y-13=0

B. 5x-y+8=0

C. 3x+3y-3=0

D. 2x+y-3=0

Answer: D

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47. The equations of the tangents drawn from (2, 3) to the ellipse $9x^2 + 16y^2 = 144$

A. y=3,x+y=5

B. x=2,x+y=5

C. x=2,y=3

D. y=3,x-y+1=0

Answer: A

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48. If $a > b$ and e is the eccentricity of the ellipse then the equation of the normal at the end of the latusrectum in the first quadrant is

A. $x - ey + ae^3 = 0$

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

C. $x + ey + ae^3 = 0$

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

Answer: D

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49. If the normal at one end of latusrectum of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ passes through one end of minor axis then

A. $e+e^2=1$

B. $a^2e^4+e^2=1$

C. $e^4-e^2=1$

D. $e^4-e^2=2$

Answer: B

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50. The equation to the locus of point of intersection of lines $y-mx=\sqrt{4m^2+3}$ and $my+x=\sqrt{4+3m^2}$ is

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

B. $x^2+y^2=7$

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

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

Answer: B

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51. The number of tangents that can be drawn to an ellipse perpendicular to a given straight lin

A. 0

B. 1

C. 2

D. 3

Answer: C

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52. If the chords of contact of tangents from two points to the ellipse are a right angles, then show that $\frac{x_1x_2}{y_1y_2} = -\frac{a^4}{b^4}$

A. -16

B. 4

C. 6

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

Answer: A

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53. The mid point of the chord 3x - 2y + 8 = 0 of the ellipse $3x^2 + 4y^2 = 24$ is

A. 1,-2

B. 2,-1

C. $-2, 1$

D. 2,1

Answer: C

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54. The distance of a point on the ellipse $x^2 + 3y^2 = 6$ from its centre is 2. Find the eccentric angle of the point.

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

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

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

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

Answer: C

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55. The equation of the tangent at a point $\theta = 3\pi/4$ to the ellipse $x^2/16 + y^2/9 = 1$ is

A. $3x + 4y + 12\sqrt{2} = 0$

B. $3x + 4y - 12\sqrt{2} = 0$

C. $3x - 4y + 12\sqrt{2} = 0$

D. $3x - 4y - 12\sqrt{2} = 0$

Answer: C

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56. The equation of the normal to the ellipse at the point whose eccentric angle $\theta = \frac{\pi}{6}$ is

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57. P is a point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ S and S^1 are foci A & A^1 are the vertices of the ellipse then the ratio $\left| \frac{SP - S^1P}{SP + S^1P} \right|$ is

A. e cos θ

B. $e^2 \cos\theta$

C. $e^3 \cos\theta$

D. $\frac{1}{e}\cos\theta$

Answer: A

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58. If the chord joining two points whose eccentric angles are α and β cut the major axis of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at a distance from the centre then $\frac{\tan(\alpha)}{2}.\frac{\tan(\beta)}{2}$ =

A. $\frac{1+e}{1-e}$

B. $\frac{e+1}{e-1}$

C. $\frac{e-1}{e+1}$

D. both 2&3

Answer: D

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59. If α and β are the eccentric angles of the ends of a focal chord of the ellipse then $\cos^2\left(\frac{\alpha+\beta}{2}\right)\sec^2\left(\frac{\alpha-\beta}{2}\right)$=

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

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

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

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

Answer: D

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60. The minimum area of triangle formed by the tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ with the coordinate axes is

A. ab sq units

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

C. $\frac{(a+b)^2}{2}$ sq units

D. $\frac{a^2+ab+b^2}{2}$ sq units

Answer: A

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61. If a tangent to the ellipse meets major and minor axis at M and N respectively and C is the centre of the ellipse thejn $\frac{a^2}{(CM)^2} + \frac{b^2}{(CN)^2} =$

A. 1

B. 2

C. 3

D. 4

Answer: A

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62. The locus of the variable point P for which the chord of contact of touch the circle $x^2 + y^2 = r^2$ is

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

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

C. $\frac{x^2}{a^4} - \frac{y^2}{b^4} = \frac{1}{r^4}$

D. $\frac{x^2}{a^4} - \frac{y^2}{b^4} = \frac{1}{r^2}$

Answer: B

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63. If $\pi + \theta$ is the eccentric angle of a point on the ellipse $16x^2 + 25y^2 = 400$ then the corresponding point on the auxiliary circle is

A. $(-4\cos\theta, -4\sin\theta)$

B. $(-5\cos\theta, -5\sin\theta)$

C. $(4\cos\theta, 4\sin\theta)$

D. $(5\cos\theta, 5\sin\theta)$

Answer: B

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64. The locus of midpoints of chords of the ellipse $x^2/a^2 + y^2/b^2 = 1$ which pass through the positive end of the major axis is

A. $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{x}{a^2} = 0$

B. $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{x}{a} = 0$

C. $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{y}{b} = 0$

D. $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{x}{a} + \frac{y}{b} = 0$

Answer: B

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65. If y = mx + c is a normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ if `C=

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

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

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

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

Answer: C

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EXERCISE 4.1

1. Find the eccentricity of the ellipse

$(i)\frac{x^2}{16}+\frac{y^2}{9}=1$

$(ii)\frac{x^2}{64}+\frac{y^2}{36}=1$

$(iii)25x^2+4y^2=100$

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2. Find the eccentricity of the ellipse

$(i)\frac{x^2}{16}+\frac{y^2}{9}=1$

$(ii)\frac{x^2}{64}+\frac{y^2}{36}=1$

$(iii)25x^2+4y^2=100$

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3. Find the eccentricity of the ellipse

$(i)\frac{x^2}{16}+\frac{y^2}{9}=1$

$(ii)\frac{x^2}{64}+\frac{y^2}{36}=1$

$(iii)25x^2+4y^2=100$

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4. Find the eccentricity of the ellipse

(a) whose latus rectum is equal to

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5. Find the eccentricity of the ellipse

half of its minro axis

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6. Find the eccentricity of the ellipse

(i) whose latus rectum is equal to half of its minor axis

(ii) whose latus rectum is equal to half of its major axis

(iii) if the major axis is three times the minor axis

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7. Find the equation of the ellipse whose focus (-1,1) $e = \frac{1}{2}$ and directrix is x-y+3=0

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8. Find the equation of the ellipse with focus at (1,-1) e=$\frac{2}{3}$ and directrix as $x + y + 2 = 0$.

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9. Find the length of latus rectum of $\frac{x^2}{64} + \frac{y^2}{36} = 1$

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10. Find the equation of the ellipse with centre (2, 1),$e = \frac{1}{3}$ one end of the major axis (2,-5).

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11. Find the length of the major axis, minor axis, latus rectum, eccentricity, centre, foci and the equations to the directrices of the ellipse.

$(i) 3x^2 + y^2 - 6x - 2y - 5 = 0$

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12. Find the eccentricity, foci, length of latusrectum and the equations to the directrices of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$

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13. Find the eccentricity, co ordinates of foci-length of latus rectum and equation of directrices of the folloeing ellipses.

$9x^2 + 16y^2 - 36x + 32y - 92 = 0$

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14. Find the equation of the ellipse in the standard form given $e = \frac{1}{2}$ and it passes through (2,1)

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15. Find the equation of the ellipse in the standard from given passes throug the point (2,3), (3,-1)

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16. Find the equation of the ellipse in the standard form given latus rectum =4 and distance between foci is $4\sqrt{2}$

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17. Find the equation of the ellipse in the standard form such that distance between foci is 8 and distance between directrices is 32.

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18. Find the equation of the ellipse in the form $\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$. Given the following data.

Centre(0,-3),e=$\frac{2}{3}$, semi -minor axis =5.

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19. Find the ellipse whose vertices are (2,-2) (2,4) and $e=1/3$

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20. In an ellipse the distance between the foci is 8 and the distance between directrices is 25. then find the length of the major axis.

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21. Find the radius of the circle passing through the foci of an ellipse $9x^2 + 16y^2 = 144$ and having least radius.

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22. The equation $\frac{x^2}{10-a} + \frac{y^2}{4-a} = 1$ represents an ellipse then show that $a < 4$

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23. A man running round a race course notes that the sum of the distances of two flag posts from him is always 10 meters and the distance between the flag posts is 8 meters. Then the area of the path he encloses (in square meters) is

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24. The centre of the ellipse $\frac{(x+y-2)^2}{9}+\frac{(x-y)^2}{16}=1$ is

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25. S and T are the foci of an ellipse and B is one end of the minor axis. IF STB is an equilateral traingle , then find the eccentricity of the ellipse.

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26. Let S and S' be the two foci of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ if the circle described on SS' as diameter: to ches the ellipse in real point, then find the eccentricity of the ellipse.

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27. Let S, S' be the focii and B, B' be the minor axis of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ if $\angle BSS'=\theta$ and eccentrictiy of the ellipse is e, then show that $e=\cos\theta$

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28. Find the equation of the ellipse whose vertices are (-4, 1) (6, 1) and one of the focal chord is x - 2 y - 2 = 0

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29. A line of fixed length (a + b) moves so that its ends are always on two fixed perpendicular straight lines. Prove that a marked point on

the line which divides this line into portions of length 'a' and 'b'

describes an ellipse and also find the eccentricity of the ellipse when $a = 8, b = 12$.

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30. Find the eccentricity of the ellipse

$(i)\frac{x^2}{16} + \frac{y^2}{9} = 1$

$(ii)\frac{x^2}{64} + \frac{y^2}{36} = 1$

$(iii)25x^2 + 4y^2 = 100$

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31. Find the eccentricity of the ellipse

$(i)\frac{x^2}{16} + \frac{y^2}{9} = 1$

$(ii)\frac{x^2}{64} + \frac{y^2}{36} = 1$

$(iii)25x^2 + 4y^2 = 100$

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32. Find the eccentricity of the ellipse

$(i)\frac{x^2}{16}+\frac{y^2}{9}=1$

$(ii)\frac{x^2}{64}+\frac{y^2}{36}=1$

$(iii)25x^2+4y^2=100$

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33. Find the eccentricity of the ellipse

(i) whose latus rectum is equal to half of its minor axis

(ii) whose latus rectum is equal to half of its major axis

(iii) if the major axis is three times the minor axis

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34. Find the eccentricity of the ellipse

(i) whose latus rectum is equal to half of its minor axis

(ii) whose latus rectum is equal to half of its major axis

(iii) if the major axis is three times the minor axis

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35. Find the equation of the ellipse whose focus (-1,1) $e = \frac{1}{2}$ and directrix is x-y+3=0

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36. Find the equation of the ellipse with focus at (1,-1) e=$\frac{2}{3}$ and directrix as $x + y + 2 = 0$.

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37. Find the length of latus rectum of $\frac{x^2}{64} + \frac{y^2}{36} = 1$

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38. Find the equation of the ellipse with centre (2,-1) $e = \frac{1}{3}$ one end of the major axis (2,-5)

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39. Find the eccentricity foci,length of latus rectum and equation of directrices of the ellipses

$4x^2 + y^2 - 8x + 2y + 1 = 0$

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40. Find the eccentricity foci,length of latus rectum and equation of directrices of the ellipse

$9x^2 + 16y^2 = 144$

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41. Find the eccentricity, co ordinates of foci-length of latus rectum and equation of directrices of the folloeing ellipses.

$9x^2 + 16y^2 - 36x + 32y - 92 = 0$

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42. Find the equation of the ellipse in the standard form given $e = \frac{1}{2}$ and it passes through (2,1)

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43. Find the equation of the ellipse in the standard from given passes throug the point (2,3), (3,-1)

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44. Find the equation of the ellipse in the standard form given latus rectum =4 and distance between foci is $4\sqrt{2}$

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45. Find the equation of the ellipse in the standard form such that distance between foci is 8 and distance between directrices is 32.

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46. Find the equation of the ellipse in the form $\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$. Given the following data.

Centre(0,-3),e=$\frac{2}{3}$, semi -minor axis =5.

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47. Find the ellipse whose vertices are (2,-2) (2,4) and $e=1/3$

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48. In an ellipse the distance between the foci is 8 and the distance between directrices is 25. then find the length of the major axis.

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49. Find the radius of the circle passing through the foci of an ellipse $9x^2 + 16y^2 = 144$ and having least radius.

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50. The equation $\frac{x^2}{10-a} + \frac{y^2}{4-a} = 1$ represents an ellipse then show that $a < 4$

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51. A man running round a race course notes that the sum of the distances of two flag posts from him is always 10 meters and the distance between the flag posts is 8 meters. Then the area of the path he encloses (in square meters) is

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52. S and T are the foci of an ellipse and B is one end of the minor axis. IF STB is an equilateral traingle , then find the eccentricity of the ellipse.

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53. The circle on SS' as diameter intersects the ellipse in real points then its eccentricity

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54. Let S, S' are the focii and BB' be the minor axis of an ellipse. If $\angle BSS' = \theta$ then its eccentricity is

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55. Find the equation of the ellipse whose vertices are (-4, 1) (6, 1) and one of the focal chord is x - 2 y - 2 = 0

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56. A line of fixed length a + b moves so that its ends are always on two fixed perpendicular straight lines. Then the locus of a point which divides this line into portions of length a and b is

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EXERCISE 4.2

1. Find the equation of the tangent and normal at (2,1) on the ellipse $2x^2 + 3y^2 = 11$

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2. Find the equation of tangent and normal to the ellipse $x^2 + 8y^2 = 33$ at (-1,2).

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3. Find the value of k and hence the point of contact of the tangent line $x - y + k = 0$ with the ellise $9x^2 + 16y^2 = 144$

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4. Find the equations of the tangents to the ellipse $2x^2 + y^2 = 8$ which are

(i) parallel to x - 2y - 4

(ii) perpendicular to x + y + 2 = 0

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5. Find the equations of tangents to the ellipse $2x^2 + y^2 = 8$ which are

perpendicular to x+y+2=0

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6. Find the normals at the ends of the latus-rectum (in first quadrant) of the ellipse $9x^2 + 16y^2 = 144$

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7. Find the equations of the tangents drawn from (1 ,2) to the ellipse $3x^2 + 2(y)^2 = 5$ and also find angle between them

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8. Find the equation of the tangents to $9x^2 + 16y^2 = 144$, which makes equal intercepts on the co-ordianate axis.

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9. (i) Find the equation of director circle of $9x^2 + 25y^2 = 225$

(ii) Find the equation of auxiliary circle of $9x^2 + 16y^2 = 144$

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10. Find the equation of auxiliary circle of $9x^2 + 16y^2 = 144$

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11. Find the locus of point of intersection of tangents to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ which are inclined at an angle α with each other.

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12. Show that the point of intersection of the tangents to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1(a>b)$ which are inclined at an angle θ_1 and θ_2 with its major axis such that $\cot\theta_1+\cot\theta_2=k^2$ lies on the curve $k^2\left(y^2-b^2\right)=2xy$

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13. The product of the perpendiculars from the foci on any tangent to the ellipse $x^2/a^2+y^2/b^2=1$ is

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14. If the minor axis of an ellipse subtends an angle 90° at each focus then the eccentricity of the ellipse is

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15. Find the locus of point of intersection of tangents to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ which are inclined at an angle α with each other.

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16. Show that the equation of the normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at the positive end of latus rectum is $x-ey-e^3a=0$

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17. If the chords of contact of tangents from two points to the ellipse are a right angles, then show that $\frac{x_1 x_2}{y_1 y_2} = -\frac{a^4}{b^4}$

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18. The equation of the locus of the middle point of the portion of a tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ included between the axes is

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19. Find the co-ordinates for the points on the ellipse $x^2 + 3y^2 + 37$ at which the normal is parallel to the line 6x-5y=2.

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20. Show that the common tangent of the ellipse $3x^2 + 13y^2 = 78$ and the circle $x^2 + y^2 = 16$ is inclined at 45° with the major axis.

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21. Find the equation of the tangent and normal at (2,1) on the ellipse $2x^2 + 3y^2 = 11$

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22. Find the equation of the tangent and normal at (-1,2) on the ellipse $x^2 + 8y^2 = 33$

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23. Find the value of k and hence the point of contact of the tangent line $x - y + k = 0$ with the ellise $9x^2 + 16y^2 = 144$

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24. Find the equations of tangents to the ellipse $2x^2 + y^2 = 8$ which are

Parallel to x-2y-4=0

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25. Find the equations of tangents to the ellipse $2x^2 + y^2 = 8$ which are

perpendicular to x+y+2=0

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26. Find the normals at the ends of the latus-rectum (in first quadrant) of the ellipse $9x^2 + 16y^2 = 144$

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27. Find the equations of the pair of tangents drawn from (1,2) to the ellipse $x^2 + 2y^2 = 3$ and also find angle between them.

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28. Find the equation of the tangents to $9x^2 + 16y^2 = 144$, which makes equal intercepts on the co-ordianate axis.

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29. (i) Find the equation of director circle of $9x^2 + 25y^2 = 225$

(ii) Find the equation of auxiliary circle of $9x^2 + 16y^2 = 144$

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30. Find the equation of auxiliary circle of $9x^2 + 16y^2 = 144$

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31. Find the locus of point of intersection of two tangents to $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ which are inclined at angles α and β with major axis such that $\cot\alpha + \cot\beta = k$

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32. Show that the point of intersection of the tangents to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1(a>b)$ which are inclined at an angle θ_1 and θ_2 with its major axis such that $\cot\theta_1+\cot\theta_2=k^2$ lies on the curve $k^2\left(y^2-b^2\right)=2xy$

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33. The sum of the squares of the perpendiculars on any tangent to the ellipse $x^2/a^2+y^2/b^2=1$ from two points on the minor axis each at a distance $\sqrt{a^2-b^2}$ from the centre is

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34. If the minor axis of an ellipse subtends an angle 90° at each focus then the eccentricity of the ellipse is

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35. Find the locus of point of intersection of tangents to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ which are inclined at an angle α with each other.

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36. Show that the equation of the normal to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at the positive end of latus rectum is $x-ey-e^3a=0$

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37. If the chords of contact of tangents from two points to the ellipse are a right angles, then show that $\frac{x_1x_2}{y_1y_2}=-\frac{a^4}{b^4}$

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38. Show that locus of middle point of the portion of a tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ inclined between the axes is $\frac{a^2}{x^2}+\frac{b^2}{y^2}=4$

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39. Find the co-ordinates for the points on the ellipse x^2+3y^2+37 at which the normal is parallel to the line 6x-5y=2.

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40. A circle of radius 4, is concentric with the elllipse $3x^2+13y^2=78$. Prove that a common tangent is inclined to the major axis at an angle $\frac{\pi}{4}$

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EXERCISE 4.3

1. The distance of a point on the ellipse $x^2 + 3y^2 = 6$ from its centre is 2. Find the eccentric angle of the point.

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2. If a,P are the eccentric angles of the extremeties of a focal chord of the ellipse

(i) $e\dfrac{\cos(\alpha+\beta)}{2} = \dfrac{\cos(\alpha-\beta)}{2}$

(ii) $\dfrac{\tan(\alpha)}{2}\dfrac{\tan(\beta)}{2} = \dfrac{e-1}{e+1}$

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3. If a,P are the eccentric angles of the extremeties of a focal chord of the ellipse

(i) $e\frac{\cos(\alpha+\beta)}{2}=\frac{\cos(\alpha-\beta)}{2}$

(ii) $\frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2}=\frac{e-1}{e+1}$

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4. If $\alpha-\beta$ is constant prove that the chord joining the points α and β on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}$ =1 touches a fixed ellipse

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5. P and P' are corresponding points on an ellipse and its auxilliary circle. Prove that the tangents at P and P' intersect on the major axis.

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6. If any tangent to the ellipse makes intercepts of lengths p and q on the axes, prove that $\frac{a^2}{p^2} + \frac{b^2}{q^2} = 1$

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7. If a,P are the eccentric angles of the extremeties of a focal chord of the ellipse

(i) $e\frac{\cos(\alpha+\beta)}{2} = \frac{\cos(\alpha-\beta)}{2}$

(ii) $\frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2} = \frac{e-1}{e+1}$

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8. The tangent at a point $P(a\cos\theta, b\sin\theta)$ on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ meets the auxillary circle in two points. The chord

joining them subtends a right angle at the centre. Find the eccentricity of the ellipse:

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9. Show that the tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at points whose eccentric angles differ by $\frac{\pi}{2}$ intersect on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=2$

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10. Find the area of the triangle formed by three points on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ whose eccentric angles are α, β and γ.

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11. If the normal at any point P on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ meets the axes in G and g respectively. Find the ratio PG : Pg

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12. Show that the area of a triangle inscribed in an ellipse bears a constant ratio to the area of the triangle formed by joining points on the auxillary circle correspoinding to the vertices of the first triangle.

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13. The tangent at a point $P(\theta)$ to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ cuts the auxilliary circle at Q and R. If QR subtend a right angle at C (centre) then show that $e=\frac{1}{\sqrt{1+\sin^2\theta}}$

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14. The distance of a point on the ellipse $x^2 + 3y^2 = 6$ from its centre is 2. Find the eccentric angle of the point.

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15. IF α, β are the eccentric angles of the extremities of a focal chord of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. Then show that $e\cos\frac{\alpha+\beta}{2} = \cos\frac{\alpha-\beta}{2}$

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16. If $0_1 0_2$ are the eccentric angles of the extremeties of a focal chord (other that the verticles) of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

$(a > b$ and e its its eccentricity. Then show that

$$\frac{e+1}{e-1} = \cot\left(\frac{0_1}{2}\right).\cot\left(\frac{0_2}{2}\right).$$

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17. If $\alpha - \beta$ is constant prove that the chord joining the points α and β on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ =1 touches a fixed ellipse

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18. P and P' are corresponding points on an ellipse and its auxilliary circle. Prove that the tangents at P and P' intersect on the major axis.

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19. If any tangent to the ellipse makes intercepts of lengths p and q on the axes, prove that $\frac{a^2}{p^2}+\frac{b^2}{q^2}=1$

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20. If a,P are the eccentric angles of the extremeties of a focal chord of the ellipse

(i) $e\frac{\cos(\alpha+\beta)}{2}=\frac{\cos(\alpha-\beta)}{2}$

(ii) $\frac{\tan(\alpha)}{2}\frac{\tan(\beta)}{2}=\frac{e-1}{e+1}$

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21. The tangent at a point $P(\theta)$ to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ cuts the auxilliary circle at Q and R. If QR subtend a right angle at C (centre) then show that $e=\frac{1}{\sqrt{1+\sin^2\theta}}$

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22. Show that the tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at points whose eccentric angles differ by $\frac{\pi}{2}$ intersect on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=2$

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23. Find the area of the triangle formed by three points on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ whose eccentric angles are α, β and γ.

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24. If the normal at any point P on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ meets the axes in G and g respectively. Find the ratio PG:Pg

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25. Show that the area of a triangle inscribed in an ellipse bears a constant ratio to the area of the triangle formed by joining points on the auxiliary circle correspoinding to the vertices of the first triangle.

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26. The tangent at a point $P(\theta)$ to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ cuts the auxilliary circle at Q and R. If QR subtend a right angle at C (centre) then show that $e=\frac{1}{\sqrt{1+\sin^2\theta}}$

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EXAMPLES

1. Find the major axis, minor axis, and eccentricity to the ellipse $4(x-2y+1)^2+9(2x+y+2)^2=180$

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2. Find the equation to the ellipse whose axes are of lengths 6 and $2\sqrt{6}$ and their equations are $x-3y+3=0$ and $3x+y-1=0$ respectively

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