

Conic section (Ellipse)

1. Find the vertices, centre and foci of each of the ellipses

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

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

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

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

2. Find an equation for the ellipse that has its centre at the origin and satisfies the following given conditions. Hence, sketch its graph

a. Vertices  $(\pm 4, 0)$ , foci  $(\pm 2\sqrt{3}, 0)$

b. Foci  $(0, \pm 2)$ , length of major axis  $4\sqrt{3}$

3. Find an equation of the ellipse with vertices  $(-2, 0)$  and  $(4, 0)$ , and passing through  $(3, -\frac{5}{3})$ . Sketch the graph of the ellipse

4. The equation of an ellipse is  $3x^2 + y^2 + 30x + 10y + 79 = 0$

a. Obtain the standard form for the equation of the ellipse

b. Find the coordinates of the centre and foci of the ellipse

c. Sketch the ellipse and indicate the points C, F1 and F2 on the ellipse

5. Identify the vertices, foci, domain and range for the following ellipses, then graph

a.  $9x^2 + 49y^2 = 441$

b.  $\frac{(x+3)^2}{4} + \frac{(y-2)^2}{36} = 1$

c.  $4x^2 + y^2 + 24x + 2y = -33$

6. Find the equation of this ellipse, graph and find the domain and range. Given endpoints of major and minor axis at  $(-1, -6)$  and  $(-1, 2)$  and focus at  $(-1, -3)$

7. Two girls are standing in a whispering gallery that is shaped like semi-elliptical arch. The height of the arch is 30 feet, and the width is 100 feet. How far from the center of the room should whispering dishes be placed so that the girl can whisper to each other?

8. An ice rink is in the shape of an ellipse, and is 150 feet long and 75 feet wide. What is the width of the rink 15 feet from a vertex?

9. If the equation of an ellipse is  $\frac{x^2}{16} + \frac{y^2}{9} = 1$ , find its eccentricity  $e$

10. Find the number of points of intersection of the ellipse  $\frac{(x+1)^2}{4} + y^2 = 1$  and the parabola  $y = 1 - (x + 1)^2$ .

11. The straight line  $y = x + k$  passes through the centre of the ellipse  $x^2 + 9y^2 - 4x + 18y + 4 = 0$ . Find  $k$

12. If F1 and F2 are the foci of an ellipse  $\frac{x^2}{4} + \frac{y^2}{3} = 1$ , find the length of F1F2

13. P is a point on ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  whose foci are S and S'. Prove that  $SP + S'P = 2a$

14. an ellipse is symmetrical about x and y axes and passes through the point  $(2, 4)$ . Suppose the major axis of the ellipse is three times the minor axis, where the major axis is parallel to the x-axis, find the equation of the ellipse

15. if the ellipse  $x^2 + \frac{y^2}{b^2} = 1$  and the line  $y = x - 7$  are tangent to each other, find the value of  $b^2$