

Graph the ellipse given by each equation. (Example 1)

1. $\frac{(x+2)^2}{9} + \frac{y^2}{49} = 1$

2. $\frac{(x+4)^2}{9} + \frac{(y+3)^2}{4} = 1$

3. $x^2 + 9y^2 - 14x + 36y + 49 = 0$

4. $4x^2 + y^2 - 64x - 12y + 276 = 0$

5. $9x^2 + y^2 + 126x + 2y + 433 = 0$

6. $x^2 + 25y^2 - 12x - 100y + 111 = 0$

Write an equation for the ellipse with each set of characteristics. (Example 2)

7. vertices $(-7, -3), (13, -3)$;
foci $(-5, -3), (11, -3)$

8. vertices $(4, 3), (4, -9)$;
length of minor axis is 8

9. vertices $(7, 2), (-3, 2)$;
foci $(6, 2), (-2, 2)$

10. major axis $(-13, 2)$ to $(1, 2)$;
minor axis $(-6, 4)$ to $(-6, 0)$

11. foci $(-6, 9), (-6, -3)$;
length of major axis is 20

12. co-vertices $(-13, 7), (-3, 7)$;
length of major axis is 16

13. foci $(-10, 8), (14, 8)$;
length of major axis is 30

Determine the eccentricity of the ellipse given by each equation. (Example 3)

14. $\frac{(x+5)^2}{72} + \frac{(y-3)^2}{54} = 1$

15. $\frac{(x+6)^2}{40} + \frac{(y-2)^2}{12} = 1$

16. $\frac{(x-8)^2}{14} + \frac{(y+3)^2}{57} = 1$

17. $\frac{(x+8)^2}{27} + \frac{(y-7)^2}{33} = 1$

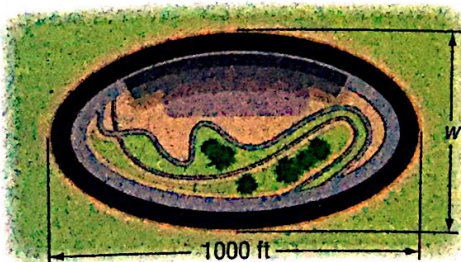
18. $\frac{(x-1)^2}{12} + \frac{(y+2)^2}{9} = 1$

19. $\frac{(x-11)^2}{17} + \frac{(y+15)^2}{23} = 1$

20. $\frac{x^2}{38} + \frac{(y-12)^2}{13} = 1$

21. $\frac{(x+9)^2}{10} + \frac{(y+11)^2}{8} = 1$

22. **RACING** The design of an elliptical racetrack with an eccentricity of 0.75 is shown. (Example 4)



What is the maximum width w of the track?

23. **CARPENTRY** A carpenter has been hired for a pet grooming business. The plan is for an elliptical shape with an eccentricity of 0.75 and a length of 36 inches. (Example 4)



- What is the maximum height of the sign?
- Write an equation for the ellipse if the foci are located at the center of the sign.

Write each equation in standard form. Identify the conic. (Example 5)

24. $x^2 + y^2 + 6x - 4y - 3 = 0$

25. $4x^2 + 8y^2 - 8x + 48y + 44 = 0$

26. $x^2 - 8x - 8y - 40 = 0$

27. $y^2 - 12x + 18y + 153 = 0$

28. $x^2 + y^2 - 8x - 6y - 39 = 0$

29. $3x^2 + y^2 - 42x + 4y + 142 = 0$

30. $5x^2 + 2y^2 + 30x - 16y + 27 = 0$

31. $2x^2 + 7y^2 + 24x + 84y + 310 = 0$

32. **HISTORY** The United States Capitol has a room with an elliptical ceiling. This type of room is called a *gallery* because sound that is projected from one focus of an ellipse reflects off the ceiling and back to the other focus. The room in the Capitol is 96 feet in length and 23 feet wide, and has a ceiling that is 23 feet high.

- Write an equation modeling the shape of the ceiling. Assume that it is centered at the origin and the major axis is horizontal.
- Find the location of the two foci.
- How far from one focus would one have to stand to be able to hear the sound reflecting from the other focus?

Write an equation for a circle that satisfies each set of conditions. Then graph the circle.

33. center at $(3, 0)$, radius 2

34. center at $(-1, 7)$, diameter 6

35. center at $(-4, -3)$, tangent to $y = 3$

36. center at $(2, 0)$, endpoints of diameter at $(-5, 0)$ and $(9, 0)$