Exercises

Communicate

1. Explain how to tell from the standard equation of a parabola whether the graph opens upward, downward, to the left, or to the right.
2. How can you determine from the standard equation of a parabola the locations of the focus, vertex, and directrix?
3. Explain how to graph $x = \frac{3}{4}y^2$ on a graphics calculator.

Guided Skills Practice

4. Graph $x = y^2$. Label the vertex, focus, and directrix. ***(EXAMPLE 1)***
5. Write the standard equation of the parabola with its vertex at the origin and with the directrix $x = 3$. ***(EXAMPLE 2)***

APPLICATION

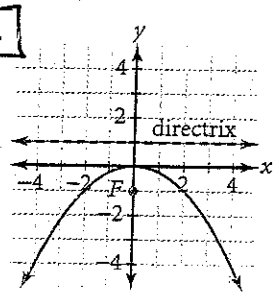
6. **SPORTS** Refer to the parabolic reflector described at the beginning of the lesson. Write the standard equation of the parabola that is a cross section of a reflector whose feedhorn is 12 inches long. ***(EXAMPLE 3)***
7. Write the standard equation for the parabola with its focus at $(-2, 3)$ and with the directrix $x = 3$. ***(EXAMPLE 4)***
8. Graph the parabola $x^2 + 10x + 16y - 7 = 0$. Label the vertex, focus, and directrix. ***(EXAMPLE 5)***

Due Friday 5/2

Practice and Apply

Write the standard equation for each parabola graphed below.

9.



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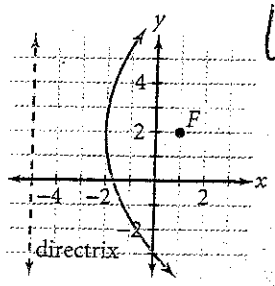

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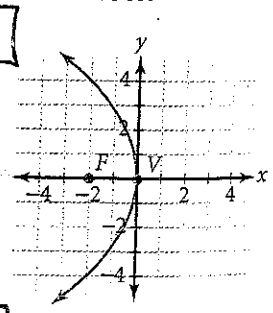

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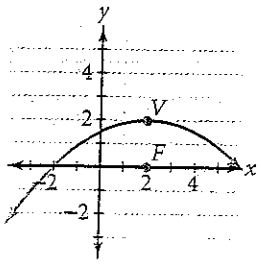

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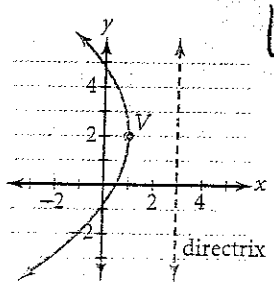

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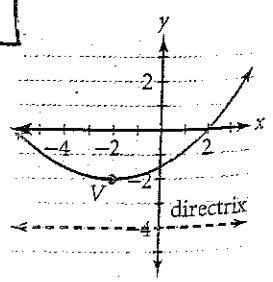

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Graph each equation. Label the vertex, focus, and directrix.

15. $y = \frac{1}{4}x^2$
16. $y = \frac{1}{8}x^2$
17. $x = \frac{1}{20}y^2$
18. $x = \frac{1}{40}y^2$
19. $y = x^2$
20. $y = 2x^2$
21. $y + 3 = \frac{1}{8}(x + 2)^2$
22. $x - 1 = \frac{1}{12}(y + 2)^2$
23. $y - 4 = -(x - 1)^2$
24. $y - 1 = \frac{1}{4}(x - 1)^2$
25. $y = \frac{1}{8}(x - 1)^2$
26. $x - 3 = -\frac{1}{8}(y + 1)^2$
27. $y + 3 = \frac{1}{12}x^2$
28. $-12y = (x + 2)^2$
29. $x - 1 = \frac{1}{2}(y + 2)^2$
30. $x^2 + 4x - 6y = -10$
31. $x^2 - 6x + 10y = 1$
32. $x^2 - 8x - y + 20 = 0$
33. $4x + y^2 + 3y = -5$
34. $4x + y^2 - 6y = 9$
35. $-14x + 2y^2 - 8y = 20$

Write the standard equation for the parabola with the given characteristics.

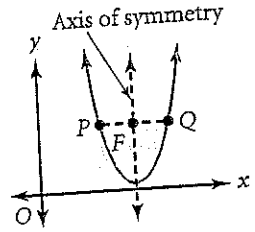
36. vertex: (0, 0) focus: (−4, 0)
37. vertex: (0, 0) focus: (0, −5)
38. vertex: (0, 0) directrix: $y = -1$
39. vertex: (0, 0) directrix: $x = 4$
40. vertex: (0, 0) focus: (0, 3)
41. vertex: (0, 0) focus: (2, 0)
42. vertex: (0, 0) directrix: $x = -3$
43. vertex: (0, 0) directrix: $y = 12$
44. directrix: $y = -4$ focus: (0, 4)
45. focus: (3, 0) directrix: $x = -3$
46. focus: (0, −5) directrix: $y = 5$
47. directrix: $x = 8$ focus: (−8, 0)

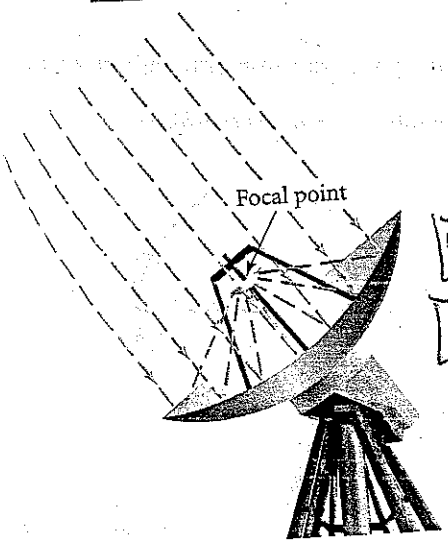
48. **TRANSFORMATIONS** A parabola defined by the equation $x + 3 = \frac{1}{8}(y + 2)^2$ is translated 4 units down and 3 units to the right. Write the standard equation of the resulting parabola.

49. **TRANSFORMATIONS** A parabola defined by the equation $4x + y^2 - 6y = 9$ is translated 2 units up and 4 units to the left. Write the standard equation of the resulting parabola.

CHALLENGE

50. **COORDINATE GEOMETRY** In the diagram at right, points P, F, and Q are collinear, P and Q are on the parabola, and F is the focus of the parabola. Also, $\overline{PQ}$ is perpendicular to the axis of symmetry of the parabola. Let $y - k = \frac{1}{4p}(x - h)^2$ be an equation for the parabola. Write an equation to find PQ in terms of h, k, p, and x.



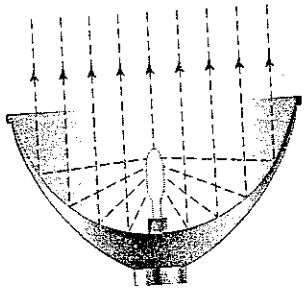


Cross section of a parabolic satellite dish

51. **COMMUNICATIONS** Write an equation for the cross section of a parabolic satellite dish whose focus is 1 foot from its vertex.

52. **SPORTS** Suppose that a golf ball travels a distance of 600 feet as measured along the ground and reaches an altitude of 200 feet. If the origin represents the tee and the ball travels along a parabolic path that opens downward, find an equation for the path of the golf ball.

53. **LIGHTING** The lightsource of a flashlight is $\frac{1}{2}$ inch from the vertex of the parabolic reflector and is located at the focus. Assuming that the parabolic reflector is directed upward and the vertex is at the origin, write an equation for a cross section of the reflector.

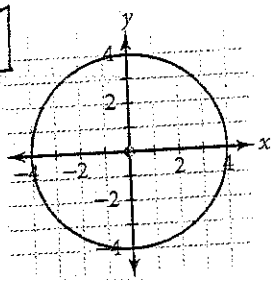


7. Write the standard equation for the circle $x^2 + 6x + y^2 - 4y - 3 = 0$. State the coordinates of its center and give its radius. Then sketch the graph. *(EXAMPLE 4)*

Practice and Apply

Write the standard equation for each circle graphed below.

8.



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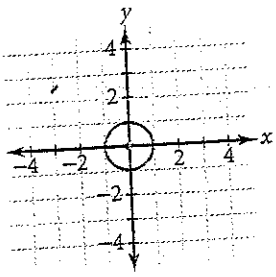

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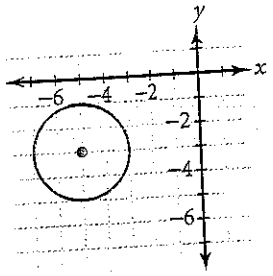

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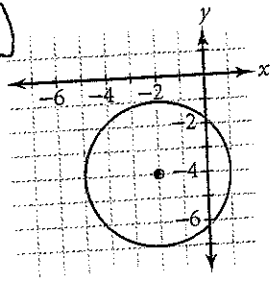

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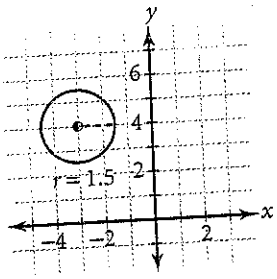

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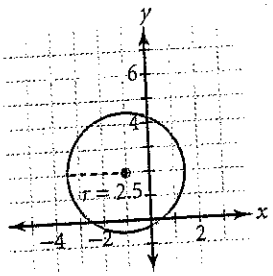

Write the standard equation of a circle with each given radius and center.

14. $r = 4$; $C(0, 0)$

15. $r = 5$; $C(0, 0)$

16. $r = 11$; $C(0, 0)$

17. $r = 7$; $C(0, 0)$

18. $r = 1$; $C(2, 3)$

19. $r = 12$; $C(3, 5)$

20. $r = 10$; $C(-2, -7)$

21. $r = 5$; $C(-5, -1)$

22. $r = 4$; $C(-2, 8)$

23. $r = 15$; $C(-6, 9)$

24. $r = 2$; $C(0, 12)$

25. $r = 3$; $C(0, 4)$

26. $r = \frac{1}{3}$; $C(-2, -2)$

27. $r = 2$; $C(3, 3)$

28. $r = \frac{1}{2}$; $C(2, 0)$

29. $r = \frac{1}{4}$; $C(1, 0)$

30. $r = 1$; $C(a, a)$, where $a > 0$

31. $r = 2$; $C(a, -2a)$, where $a > 0$

Graph each equation. Label the center and the radius.

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

33. $x^2 + y^2 = 49$

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

35. $(x + 5)^2 + y^2 = 36$

36. $x^2 + (y + 3)^2 = 16$

37. $x^2 + (y - 2)^2 = 81$

38. $(x + 1)^2 + (y + 5)^2 = 100$

39. $(x + 6)^2 + (y + 1)^2 = 4$

40. $(x - 2)^2 + (y + 2)^2 = 64$

41. $(x - 3)^2 + (y + 3)^2 = 25$

42. $(x + 4)^2 + (y - 3)^2 = 49$

43. $(x + 2)^2 + (y - 4)^2 = 16$

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