27 Parabolas

Concepts:

- Parabolas:
  - sketch a graph from an equation
  - find an equation given information about a graph
- Solving Applied Problems Involving Parabolas

(Section 10.3)

1. Match each of the following equations with the appropriate graph.

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

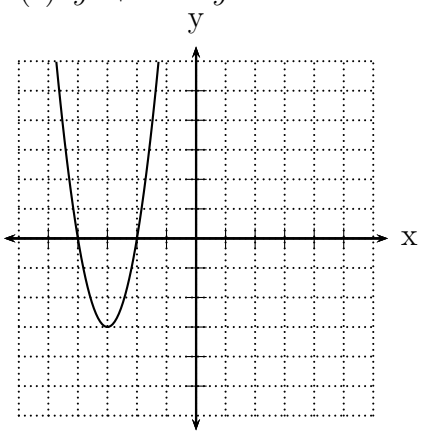
   (b) $y^2 + 8 = 2x$

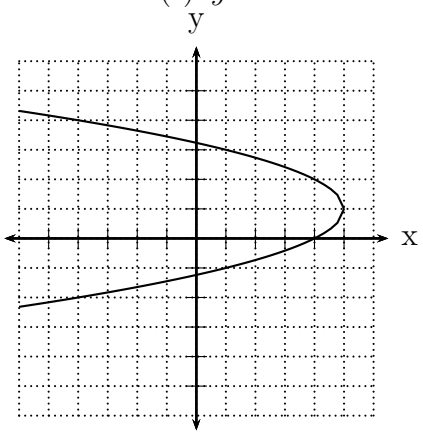
   (c) $y^2 + x - 2y - 4 = 0$

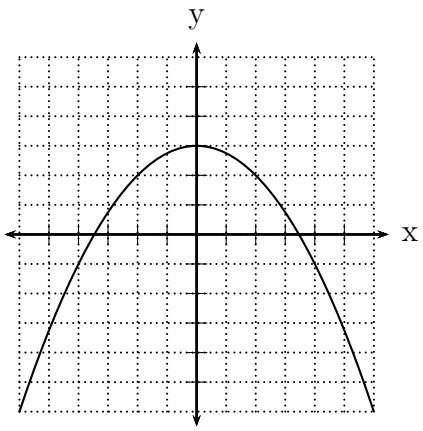
   (d) $(y+3)^2 = -\frac{1}{2}x + 2$

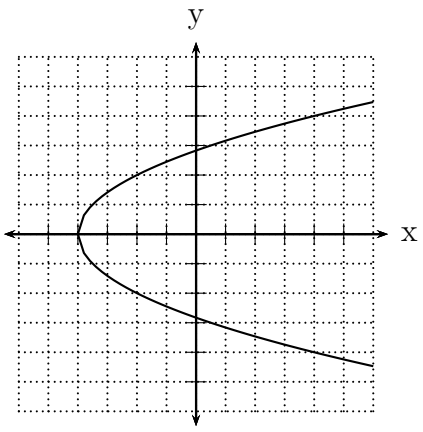
   (e) $\frac{y}{3} - 5 = x^2 + 6x + 3$

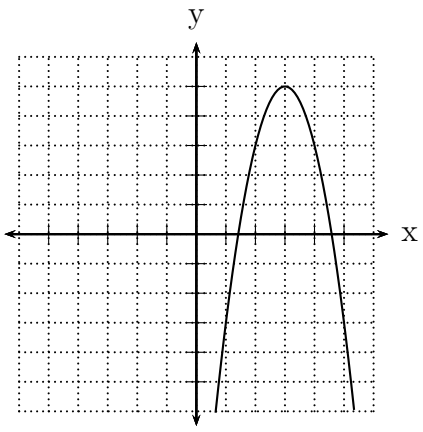
   (f) $y = 12x - 2x^2 - 13$

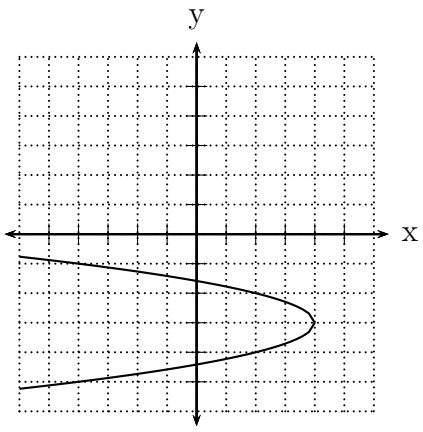












2. For each of the following, determine the vertex, focus, and directrix of the parabola *without graphing* and state whether it opens upward, downward, left, or right. Sketch the graph of each.

   (a) $y + (x + 8)^2 = 3$.

   (b) $y = 2x^2 - x - 5$.

   (c) $x = 5(y - 3)^2$.

   (d) $y = x^2 + 4x + 7$.

   (e) $x = y^2 + y + 4$.

   (f) $2y^2 = x - 4y - 4$.

   (g) $4x^2 - 40x - 2y + 111 = 0$.

3. Find the equation of the parabola satisfying the given conditions.

   (a) Vertex $(0, 2)$; axis $x = 0$; $(2, -10)$ on graph.

   (b) Vertex $(1, 3)$; axis $y = -3$; $(-1, -4)$ on graph.

   (c) Vertex $(-2, -5)$; $(-4, -4)$ and $(-4, -6)$ on graph.

   (d) Vertex $(0, 7)$; axis $x = 0$; $(2, -5)$ on graph.

   (e) Vertex $(1, -5)$; axis $y = -5$; $(-1, -6)$ on graph.

4. (Question 75, Section 10.3) A parabolic satellite dish is 4 feet in diameter and 1.5 feet deep. How far from the vertex should the receiver be placed to catch all the signals that hit the dish? [HINT: See Example 11 in Section 10.3 of your textbook.]

5. (Question 76, Section 10.3) A flashlight has a parabolic reflector that is 3 inches in diameter and 1.5 inches deep. For the light from the bulb to reflect in beams that are parallel to the center axis of the flashlight, how far from the vertex of the reflector should the bulb be located? [HINT: See Figure 10-44 on page 709 of your textbook.]

6. (Question 77, Section 10.3) A radio telescope has parabolic dish with a diameter of 300 feet. Its receiver (focus) is located 130 feet from the vertex. How deep is the dish at its center? [HINT: Position the dish as in Figure 10-47 on page 709, and find the equation of the parabola.]

7. (Question 81, Section 10.3) The cables of a suspension bridge are shaped like parabolas. The cables are attached to the towers 100 feet from the bridge surface, and the towers are 420 feet apart. The cables touch the bridge surface at the center (midway between the towers). At a point on the bridge 100 feet from one of the towers, how far is the cable from the bridge surface?