

EXERCISES

For more exercises, see *Extra Skill and Word Problem Practice*.

Practice and Problem Solving

A Practice by Example

Example 1
(page 558)



Find the equation of the axis of symmetry and the coordinates of the vertex of the graph of each function.

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

2. $f(x) = 2x^2 + 4x - 5$

3. $y = x^2 - 8x - 9$

4. $y = 3x^2 - 9x + 5$

Match each graph with its function.

A. $y = x^2 - 6x$

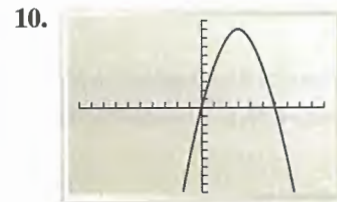
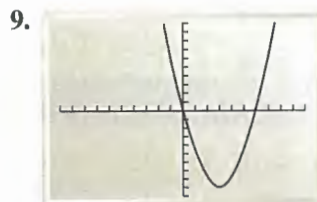
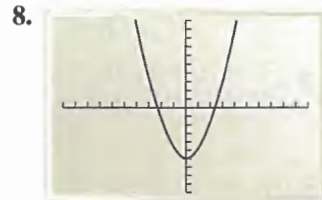
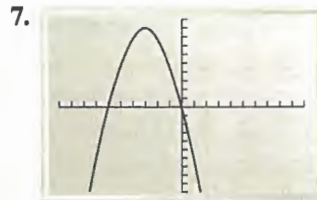
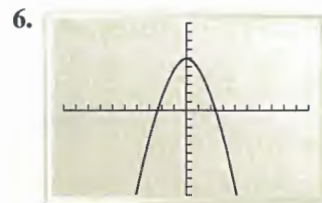
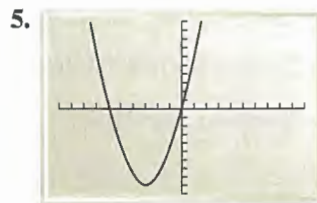
B. $y = x^2 + 6x$

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

D. $y = -x^2 + 6x$

E. $y = -x^2 + 6$

F. $y = x^2 - 6$



Graph each function. Label the axis of symmetry and the vertex.

11. $f(x) = x^2 + 4x + 3$

12. $y = 2x^2 - 6x$

13. $y = -x^2 + 4x - 4$

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

Example 2
(page 559)

15. **Gardening** Suppose you have 80 ft of fence to enclose a rectangular garden. The function $A = 40x - x^2$ gives you the area of the garden in square feet where x is the width in feet.

- What width gives you the maximum gardening area?
- What is the maximum area?

16. A ball is thrown into the air with an upward velocity of 40 ft/s. Its height h in feet after t seconds is given by the function $h = -16t^2 + 40t + 6$.

- In how many seconds does the ball reach its maximum height?
- What is the ball's maximum height?

Example 3
(page 559)

Graph each quadratic inequality.

17. $y > x^2$

18. $f(x) < -x^2$

19. $y \leq x^2 + 3$

20. $y < -x^2 + 4$

21. $y \geq -2x^2 + 6$

22. $f(x) > -x^2 + 4x - 4$

B Apply Your Skills

Graph each function. Label the axis of symmetry and the vertex.

23. $y = x^2 - 9x + 3$ 24. $f(x) = -x^2 - 4x - 6$ 25. $f(x) = x^2 - 2x + 1$
 26. $y = 2x^2 + x - 3$ 27. $y = x^2 + 3x + 2$ 28. $y = -x^2 + 8x - 5$
 29. $y = \frac{1}{2}x^2 + 2x + 1$ 30. $y = \frac{1}{4}x^2 + 2x + 1$ 31. $y = -\frac{1}{4}x^2 + 2x - 3$

Open-Ended For Exercises 32–34, give an example of a quadratic function for each description.

32. Its axis of symmetry is to the right of the y -axis.
 33. Its graph opens downward and has its vertex at $(0, 0)$.
 34. Its graph lies entirely above the x -axis.



Real-World Connection

After turning a somersault, the diver followed a parabolic path.

35. **Diving** An athlete dives from the 3-meter springboard. Her height y , at horizontal distance x , can be approximated by the function $y = -1.2x^2 + 3.12x + 3$. Both the height and distance are in meters.
 a. How far has she traveled horizontally when she reaches her maximum height? Round to the nearest tenth of a meter.
 b. What is her maximum height? Round to the nearest tenth of a meter.
36. **Road Construction** An archway over a road is cut out of rock. Its shape is modeled by the quadratic function $y = -0.1x^2 + 12$ for $y \geq 0$.
 a. Write an inequality that describes the opening of the archway.
 b. Graph the inequality.
 c. **Critical Thinking** Can a camper 6 ft wide and 7 ft high fit under the arch without crossing the median line? Explain.
37. **Multiple Choice** A small company markets a new toy. The function $S = -64p^2 + 1600p$ predicts the total sales S in dollars as a function of the price p of the toy. What price will produce the highest total sales?
 (A) \$64.00 (B) \$25.00 (C) \$12.50 (D) \$8.00

Estimation For each of the graphs below, estimate the area enclosed by the parabola, the x -axis, and the vertical lines $x = 1$ and $x = 7$. Follow the instructions below.

- Count the number of whole grid squares in the region.
- If half a square or more is included in the region, count it as one.
- If less than half a square is included in the region, do *not* count it.
- Add the counted squares to estimate the area.

