9.6 Exercises

Concept Check

Fill-in-the-Blank. Complete the sentences using information found in this section.

1. The curved graph of a quadratic function is called a/an _____.
2. The "turning point" of the graph of a quadratic function is called the _____.
3. For any real number x, x^2 _____ 0.
4. For all quadratic functions, the _____ is the set of all real numbers.
5. The _____ of the function $y = ax^2$ depends on the value of a.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

6. The graph of a quadratic function is a mirror of itself across the line, or axis, of symmetry.
7. The graph of $y = a(x - h)^2$ is a vertical shift (or vertical translation) of the graph of $y = ax^2$.
8. For a quadratic function of the form $y = ax^2$, the bigger $|a|$ is, the wider the opening of the parabola is.

Practice

Solve.

1. Graph the function $y = x^2$. Then, without additional computation, graph the following translations.

   a. $y = x^2 - 2$

   b. $y = (x - 3)^2$

   c. $y = -(x - 1)^2$

   d. $y = 5 - (x + 1)^2$

2. Graph the function $y = 2x^2$. Then, without additional computation, graph the following translations.

   a. $y = 2x^2 - 3$

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

   c. $y = -2(x + 1)^2$

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

3. Graph the function $y = \frac{1}{2}x^2$. Then, without additional computation, graph the following translations.

   a. $y = \frac{1}{2}x^2 + 3$

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

   c. $y = -\frac{1}{2}x^2$

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

4. Graph the function $y = \frac{1}{4}x^2$. Then, without additional computation, graph the following translations.

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

b. $y = \frac{1}{4}x^2 - 5$

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

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

For each of the quadratic functions, determine the line of symmetry and the vertex. Then, graph the function.

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

6. $y = \frac{2}{3}x^2 + 6$

7. $y = 7x^2 - 9$

8. $y = 5x^2 - 1$

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

10. $y = -2x^2 - 2$

11. $y = -\frac{3}{4}x^2 + 5$

12. $y = \frac{5}{3}x^2 - 3$

13. $y = (x+1)^2$

14. $y = (x-1)^2$

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

16. $y = -5(x+2)^2$

17. $y = \frac{1}{2}(x-5)^2$

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

19. $y = -4(x-6)^2$

20. $y = 2(x+7)^2$

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

22. $y = 4(x-5)^2 + 1$

23. $y = \frac{3}{4}(x+2)^2 - 6$

24. $y = -2(x+1)^2 - 4$

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

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

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

28. $y = 5(x+3)^2 - 6$

Writing & Thinking

29. Explain why the shape of the parabola of a quadratic of the form $y = ax^2$ gets narrower as the value of $|a|$ increases. (**Hint:** Pick two values of a and compare the value of y for different values of x.)