8.1 Start Thinking

Use a graphing calculator to graph the functions in the table. Then complete the table.

Quadratic equation	Shape	Relationship to $y = x^2$
$y = 2x^2$		
$y = \frac{1}{2}x^2$		
$y = -x^2$		
$y = (2x)^2$		

How does the value of the coefficient of x^2 change the graph of the quadratic equation? Which graph looks the most different from the others? Explain.

8.1 Warm Up

Graph the equation.

1. $y = -x - 1$ **2.** $y = \frac{3}{2}x + 2$ **3.** $y = -x - 2$

4. $y = 3x + 3$ **5.** $y = x$ **6.** $y = \frac{3}{4}x - 3$

8.1 Cumulative Review Warm Up

Use the Distributive Property to find the product.

1. $(x - 2)(x - 2)$ **2.** $(z + 6)(z - 2)$ **3.** $(g + 8)(g + 1)$

4. $(y - 7)(y - 3)$ **5.** $(4m)(m - 10)$ **6.** $(x - 4)(x - 1)$

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8.1 Practice A

In Exercises 1–6, graph the function. Compare the graph to the graph of $f(x) = x^2$.

1. $g(x) = 4x^2$

2. $h(x) = 1.5x^2$

3. $j(x) = \frac{1}{3}x^2$

4. $g(x) = -3x^2$

5. $k(x) = -\frac{5}{2}x^2$

6. $n(x) = -0.5x^2$

In Exercises 7–9, use a graphing calculator to graph the function. Compare the graph to the graph of $y = -5x^2$.

7. $y = 5x^2$

8. $y = -0.5x^2$

9. $y = -0.05x^2$

10. The arch support of a bridge can be modeled by $y = -0.00125x^2$, where x and y are measured in feet.

a. The width of the arch is 800 feet. Describe the domain of the function. Explain.

b. Use a graphing calculator to graph the function, using the domain in part (a). Find the height of the arch.

11. Is the y-intercept of the graph of $y = ax^2$ always 0? Explain.

In Exercises 12–15, determine whether the statement is *always*, *sometimes*, or *never* true. Explain your reasoning.

12. The graph of $f(x) = ax^2$ is narrower than the graph of $g(x) = dx^2$ when $d = -a$.

13. The graph of $f(x) = ax^2$ opens in the same direction as the graph of $g(x) = dx^2$ when $d = |a|$.

14. The graph of $f(x) = ax^2$ opens in the same direction as the graph of $g(x) = dx^2$ when $g(x) = f(-x)$.

15. The graph of $f(x) = ax^2$ opens in the same direction as the graph of $g(x) = dx^2$ when $g(x) = -f(x)$.

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8.1 Practice B

In Exercises 1–6, graph the function. Compare the graph to the graph of $f(x) = x^2$.

1. $g(x) = 7x^2$

2. $h(x) = 0.25x^2$

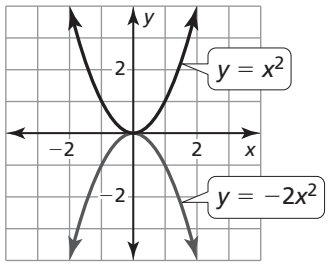
3. $j(x) = \frac{7}{2}x^2$

4. $g(x) = -\frac{5}{3}x^2$

5. $k(x) = -\frac{3}{4}x^2$

6. $n(x) = -0.4x^2$

7. Describe and correct the error in graphing and comparing $y = x^2$ and $y = -2x^2$.



The graphs have the same vertex and the same axis of symmetry. The graph of $y = -2x^2$ is a reflection in the x-axis of the graph of $y = x^2$.

8. The arch support of a bridge can be modeled by $y = -\frac{1}{300}x^2$, where x and y are measured in feet.

a. The width of the arch is 900 feet. Describe the domain of the function. Explain.

b. Use a graphing calculator to graph the function, using the domain in part (a). Find the height of the arch.

9. A parabola opens down and passes through the points $(-3, 4)$ and $(1, -2)$. How do you know that $(-3, 4)$ could be the vertex?

10. Given the parabola $f(x) = ax^2$.

a. Find the value of a when the graph passes through $(3, -1)$ and $a < 0$.

b. Find the value of a when the graph passes through $(3, -1)$ and $a > 0$. Explain.

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8.1 Enrichment and Extension

Working with Quadratic Functions

In Exercises 1–14, use your knowledge of quadratic functions.

1. Write the equation of any quadratic function $\left(\text{except } y = x^2\right)$.
2. Graph the function.
3. Determine the maximum (or minimum) point of the equation.
4. Determine the domain and range for the function.
5. What is the solution to the equation $x^2 = 25$?
6. Graph the function $y = x^2 - 25$.
7. How does the graph of the function in Exercise 6 help in determining the solution to the equation?
8. What is the solution to the equation $x^2 = 16$?
9. Graph the function $y = x^2 - 16$.
10. How does the graph of the function in Exercise 9 help in determining the solution to the equation?
11. What is the solution to the equation $x^2 = -4$?
12. Graph the function $y = x^2 + 4$.
13. Why is the graph of this function different from the graphs of the functions in Exercises 6 and 9?
14. Make a conjecture of the possible reasons for your answer to Exercise 13.

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8.1 Puzzle Time

Where Does A Squirrel Keep Its Winter Clothes?

Write the letter of each answer in the box containing the exercise number.

Compare the graph of the function to the graph of $f(x) = x^2$.

1. $b(x) = -x^2$

2. $p(x) = 5x^2$

3. $q(x) = \frac{1}{3}x^2$

4. $t(x) = -4x^2$

5. $c(x) = -0.2x^2$

6. $h(x) = 6.4x^2$

7. $r(x) = 0.12x^2$

8. $d(x) = -\frac{8}{5}x^2$

9. $s(x) = \frac{2}{3}x^2$

10. $k(x) = \frac{1}{9}x^2$

11. The graph of a parabolic bowl can be represented by $g(x) = \frac{2}{5}x^2$. Compare the graph to the graph of $f(x) = x^2$.

12. The decorated archway at the entrance to a craft fair can be represented by $h(x) = -7x^2$. Compare the graph to the graph of $f(x) = x^2$.

Answers

E. vertical shrink by a factor of $\frac{1}{3}$

T. vertical shrink by a factor of $\frac{1}{9}$

K. reflection in the x-axis; vertical shrink by a factor of 0.2

N. reflection in the x-axis

A. vertical shrink by a factor of $\frac{2}{5}$

T. vertical shrink by a factor of 0.12

R. reflection in the x-axis; vertical stretch by a factor of 4

N. vertical stretch by a factor of 5

R. reflection in the x-axis; vertical stretch by a factor of $\frac{8}{5}$

I. vertical stretch by a factor of 6.4

E. vertical shrink by a factor of $\frac{2}{3}$

U. reflection in the x-axis; vertical stretch by a factor of 7

6	2		11		7	4	9	3		10	8	12	1	5