Name_____ Date _____

2.1 Practice B

In Exercises 1–6, describe the transformation of $f(x) = x^2$ represented by g. Then graph each function.

1. $g(x) = x^2 + 3$

2. $g(x) = (x + 5)^2$

3. $g(x) = (x + 6)^2 - 4$

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

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

6. $g(x) = (x + 8)^2 - 2$

In Exercises 7–9, describe the transformation of $f(x) = x^2$ represented by g. Then graph each function.

7. $g(x) = -\left(\frac{1}{2}x\right)^2$

8. $g(x) = \frac{1}{3}x^2 + 2$

9. $g(x) = \frac{1}{3}(x + 1)^2$

In Exercises 10 and 11, describe the transformation of the graph of the parent quadratic function. Then identify the vertex.

10. $f(x) = -3(x + 6)^2 - 4$

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

In Exercises 12 and 13, write a rule for g described by the transformations of the graph of f. Then identify the vertex.

12. $f(x) = x^2$; vertical shrink by a factor of $\frac{1}{2}$ and a reflection in the y-axis, followed by a translation 2 units left

13. $f(x) = (x + 4)^2 + 2$; horizontal shrink by a factor of $\frac{1}{3}$ and a translation 2 units up, followed by a reflection in the x-axis

14. Justify each step in writing a function g based on the transformations of $f(x) = 4x^2 - 3x$.

translation 3 units up followed by a reflection in the y-axis

$h(x) = f(x) + 3$	
$= 4x^2 - 3x + 3$	
$g(x) = h(-x)$	
$= 4x^2 + 3x + 3$	

Name _____ Date _____

2.2 Practice B

In Exercises 1–12, graph the function. Label the vertex and axis of symmetry.

1. $f(x) = -3(x - 2)^2 - 4$

2. $f(x) = 3(x + 1)^2 + 5$

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

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

5. $y = 0.6(x - 2)^2$

6. $f(x) = 0.25x^2 - 1$

7. $y = -x^2 + 8$

8. $y = 7x^2 + 2$

9. $y = 1.5x^2 - 6x + 3$

10. $f(x) = 0.5x^2 + 3x - 1$

11. $y = \frac{5}{2}x^2 - 5x + 1$

12. $f(x) = -\frac{3}{2}x^2 - 6x - 4$

13. A quadratic function is decreasing to the left of $x = 3$ and increasing to the right of $x = 3$. Will the vertex be the highest or lowest point on the graph of the parabola? Explain.

14. The graph of which function has the same axis of symmetry as the graph of $y = 2x^2 - 8x + 3$? Explain your reasoning.

A. $y = -4x^2 + 16x - 5$

B. $y = 2x^2 + 8x + 7$

C. $y = 3x^2 - 6x + 7$

D. $y = -6x^2 + 10x - 1$

In Exercises 15–18, find the minimum or maximum value of the function. Describe the domain and range of the function, and where the function is increasing and decreasing.

15. $y = 3x^2 + 12$

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

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

18. $f(x) = \frac{1}{2}x^2 + 3x + 7$

19. The height of a bridge is given by $y = -3x^2 + x$, where y is the height of the bridge (in miles) and x is the number of miles from the base of the bridge.

a. How far from the base of the bridge does the maximum height occur?

b. What is the maximum height of the bridge?

Name _____ Date _____

2.2 Puzzle Time

What Is Roz Savage Famous For?

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

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise number.

0 minimum WOMAN	8 maximum FIRST
2 maximum THE	$f(x) = -(x-2)^2 + 4$ THREE
$(-1, -9.5)$ $x = -1$ ROWER	-50 minimum TO
$f(x) = -2(x+1)^2 - 1$ OCEANS	$f(x) = \frac{1}{2}x^2$ ACROSS
$f(x) = x^2 - 2$ ROW	$(0, -3)$ $x = 0$ THIS
$(1, -4)$ $x = 1$ BRITISH	$(2, 7)$ $x = 2$ WAS

Find the vertex and axis of symmetry of the function.

1. $f(x) = 9x^2 - 3$

2. $y = -x^2 + 2x - 5$

3. $g(x) = -0.5x^2 - x - 10$

4. $f(x) = -2x^2 + 8x - 1$

Find the minimum or maximum value of the function.

5. $f(x) = -3x^2 + 12x - 10$

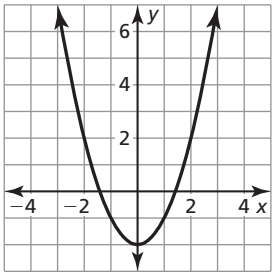
6. $y = -x^2 + 8$

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

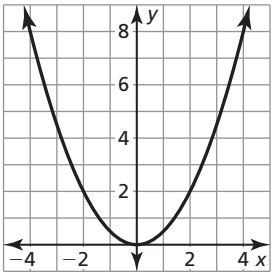
8. $y = 2x^2 - 20x$

Match the graph with its function.

9.



10.



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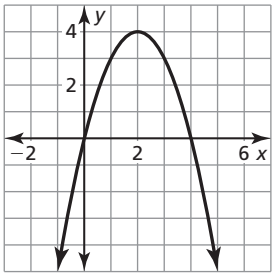

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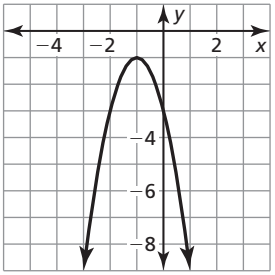


Name _____ Date _____

2.4 Practice B

In Exercises 1–3, write an equation of the parabola in vertex form.

1. passes through $(4, -7)$ and has vertex $(1, -6)$

2. passes through $(5, -4)$ and has vertex $(-2, 5)$

3. passes through $(2, 2)$ and has vertex $(-1, -1)$

In Exercises 4–6, write an equation of the parabola in intercept form.

4. x-intercepts of 12 and 8; passes through $(9, 5)$

5. x-intercepts of -7 and -1; passes through $(1, 1)$

6. x-intercepts of -9 and 9; passes through $(0, 4)$

7. Describe and correct the error in writing an equation of the parabola.

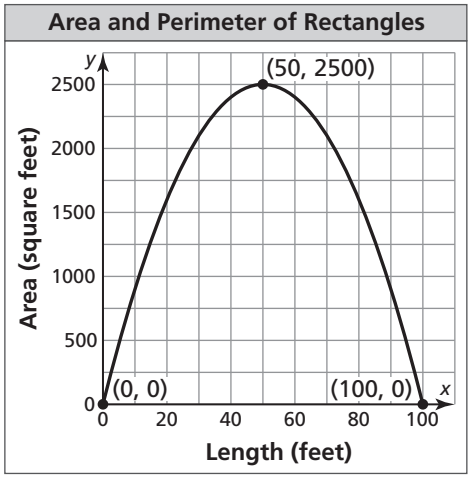
✗ Vertex: $(3, -5)$

Passes through $(1, -7)$

$$y = a(x - h)^2 + k$$
$$-5 = a(3 - 1)^2 + (-7)$$
$$-5 = 4a - 7$$
$$2 = 4a$$
$$\frac{1}{2} = a$$

The equation is $y = \frac{1}{2}(x - 1) - 7$.

8. The graph shows the area y (in square feet) of rectangles that have a perimeter of 200 feet and a length of x feet.



   a. Interpret the meaning of the vertex in this situation.

   b. Write an equation for the parabola to predict the area of the rectangle when the length is 2 feet.

   c. Compare the average rates of change in the area from 0 to 50 feet and 50 to 100 feet.

Name_____ Date _____

2.4 Enrichment and Extension

Modeling with Quadratic Functions

In Exercises 1–5, analyze the differences in the outputs. Determine whether the data are linear or quadratic. Write an equation that fits the data. If quadratic, write the equation in (a) standard form and (b) vertex form, and (c) state the transformation from the parent function x^2.

1.

Altitude (1000 feet), *x*	1	1.5	2	2.5	3
Boiling water temperature (°F), *y*	210.3	209.4	208.5	207.6	206.7

2.

Time (seconds), *x*	1	2	3	4	5
Height (feet), *y*	73.5	78.4	73.5	58.8	34.3

3.

Units sold, *x*	1	2	3	4	5
Profit (thousands of dollars), *y*	39	60	75	84	87

4.

Depth (feet), *x*	0	10	20	30	40
Pressure (pounds per square inch), *y*	14.7	19.03	23.36	27.69	32.02

5.

Time (seconds), *x*	1	1.5	2	2.5	3
Height (feet), *y*	12	12.75	11	6.75	0