LESSON 3.3

Exercise Set A

MM1A1b Graph the basic functions $f(x) = x^n$, where $n = 1$ to 3, $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.

MM1A1c Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x- and y-axes.

MM1A1d Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.

Graph the function and identify its domain and range. *Compare* the graph with the graph of $y = \sqrt{x}$.

1. $y = 7\sqrt{x}$ **2.** $y = \frac{1}{5}\sqrt{x}$ **3.** $y = -4\sqrt{x}$

***Describe* how you would graph the function by using the graph of $y = \sqrt{x}$.**

4. $y = \sqrt{x - 8}$ **5.** $y = \sqrt{x} + 3$ **6.** $y = \sqrt{x + 7}$

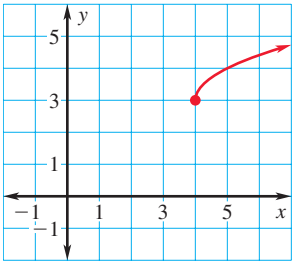
7. $y = \sqrt{x} - 5$ **8.** $y = \sqrt{-x} + 3.5$ **9.** $y = \sqrt{x - \frac{1}{2}}$

Match the function with its graph.

10. $y = \sqrt{x + 4} - 3$ **11.** $y = \sqrt{x - 3} + 4$ **12.** $y = \sqrt{x - 4} + 3$

13. $y = \sqrt{x - 4} - 3$ **14.** $y = \sqrt{x + 3} - 4$ **15.** $y = \sqrt{x + 3} + 3$

A.



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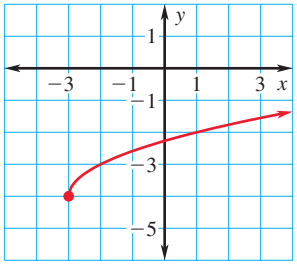

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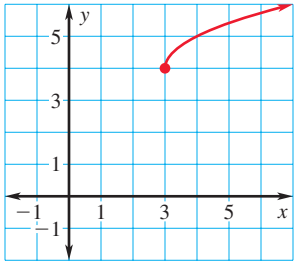

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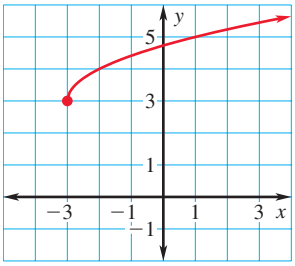

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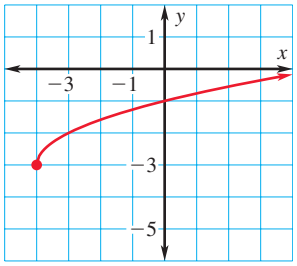

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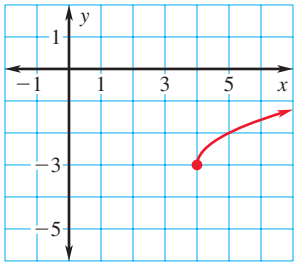


UNIT 3

Exercise Set A *(continued)*

16. **Multiple Choice** The graph of which function is a horizontal translation of 3 units to the right of the graph of $y = \sqrt{x}$?

A. $y = \sqrt{x} + 3$ **B.** $y = \sqrt{x} - 3$

C. $y = \sqrt{x + 3}$ **D.** $y = \sqrt{x - 3}$

Graph the function and identify its domain and range. *Compare* the graph with the graph of $y = \sqrt{x}$.

17. $y = \sqrt{x + 4} - 4$ **18.** $y = \sqrt{x + 5} + 1$ **19.** $y = \sqrt{x - 6} + 4$

20. $y = \sqrt{x - 5} - 7$ **21.** $y = \sqrt{x - 1} + 2$ **22.** $y = \sqrt{x + 5} - 4$

23. **Multiple Representations** The time t (in seconds) it takes an object dropped from a height h (in feet) to reach the ground is given by the function $t = \frac{1}{4}\sqrt{h}$.

a. **Making a Table** Make a table that shows the values of t for $h = 0$, 25, 100, and 225 feet.

b. **Graphing an Equation** Use the table in part (a) to graph the function. Estimate the height of a building if it takes a stone 4 seconds to reach the sidewalk below when dropped from the top of the building.

c. **Checking Reasonableness** Is your solution from part (b) reasonable in this situation? *Explain.*

24. **Box Design** You are designing a box with a square base that will hold popcorn. The box must be 9 inches tall. The side length y (in inches) of the box is given by the function $y = \frac{1}{3}\sqrt{V}$ where V is the volume (in cubic inches) of the box.

a. Graph the function and identify its domain and range.

b. What is the volume of a box with a side length of 5 inches?

c. What is the volume of a box with a side length of 8 inches?

25. **Steel Pipe** The inside diameter d of a steel pipe (in inches) and the weight w of water in the pipe (in pounds) are related by the function $d = 1.71\sqrt{w}$.

a. Graph the function and identify its domain and range.

b. What does the water weigh in a pipe with an inside diameter of 17 inches? Round your answer to the nearest pound.

c. What does the water weigh in a pipe with an inside diameter of 3.5 inches? Round your answer to the nearest pound.

LESSON 3.3

Exercise Set B

MM1A1b Graph the basic functions $f(x) = x^n$, where $n = 1$ to 3, $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.

MM1A1c Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x- and y-axes.

MM1A1d Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.

Graph the function and identify its domain and range. *Compare* the graph with the graph of $y = \sqrt{x}$.

1. $y = 2.5\sqrt{x}$ **2.** $y = -\frac{3}{5}\sqrt{x}$ **3.** $y = -0.25\sqrt{x}$

***Describe* how you would graph the function by using the graph of $y = \sqrt{x}$.**

4. $y = \sqrt{x + 2.5}$ **5.** $y = \sqrt{x} - \frac{3}{2}$ **6.** $y = \sqrt{-x} + 12$

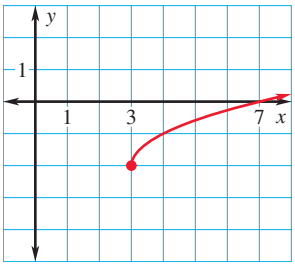
7. $y = \sqrt{x - \frac{1}{4}}$ **8.** $y = \sqrt{x + 5.5}$ **9.** $y = \sqrt{x} + \frac{3}{4}$

Match the function with its graph.

10. $y = 3\sqrt{x + 2} - 1$ **11.** $y = 2\sqrt{x - 1} + 3$ **12.** $y = 3\sqrt{x - 1} + 2$

13. $y = \sqrt{x - 3} - 2$ **14.** $y = 3\sqrt{x + 1} - 2$ **15.** $y = \sqrt{x + 2} + 3$

A.



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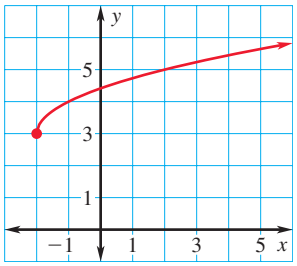

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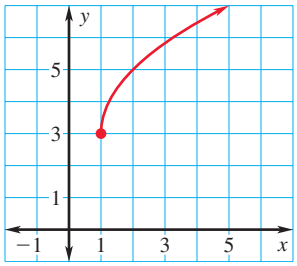

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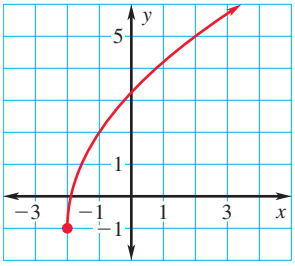

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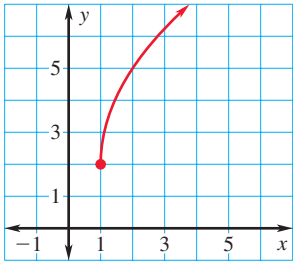

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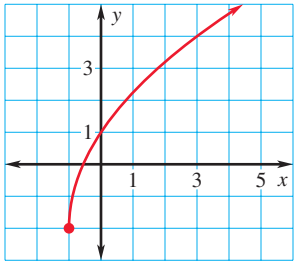

UNIT 3

Exercise Set B *(continued)*

Graph the function and identify its domain and range. *Compare* the graph with the graph of $y = \sqrt{x}$.

16. $y = \sqrt{x + 6} - 4$

17. $y = -\sqrt{x - 1} + 5$

18. $y = \sqrt{x - 3} - 3$

19. $y = -\sqrt{x + 6} + 2$

20. $y = \sqrt{x - 7} + 8$

21. $y = -\sqrt{x - 4.5} + 2.5$

22. **Error Analysis** *Describe* and correct the error in explaining how to graph the function $y = -5\sqrt{x - 8} - 12$.

> To graph $y = -5\sqrt{x - 8} - 12$, sketch the graph of $y = -5\sqrt{x}$. Then shift the graph 8 units to the left and 12 units down.

23. **Multiple Choice** How is the graph of $g(x) = 4\sqrt{x} - 2$ related to the graph of $h(x) = 4\sqrt{x} + 2$?

A. It is a vertical stretch by a factor of 2 of the graph of h.

B. It is a vertical translation of 2 units down of the graph of h.

C. It is a vertical translation of 4 units down of the graph of h.

D. It is a horizontal translation of 4 units to the left of the graph of h.

24. **Challenge** Write a rule for a radical function that has a domain of all real numbers greater than or equal to -4 and a range of all real numbers less than or equal to 3.

25. **Bridge** The time t (in seconds) it takes an object dropped from a height h (in meters) to reach the ground is given by the function $t = \frac{\sqrt{10}}{7}\sqrt{h}$.

a. Graph the function and identify its domain and range.

b. You are on a bridge that passes over a river. It takes about 1.5 seconds for a stone dropped from the bridge to reach the river. About how high is the bridge?

26. **Steel Pipe** The radius of gyration of a steel pipe is a number that describes a pipe's resistance to buckling. The greater value of r, the more resistance to buckling. The radius of gyration r (in inches) of a steel pipe is given by the function $r = \frac{1}{4}\sqrt{D^2 + d^2}$ where D is the outside diameter of the pipe (in inches) and d is the inside diameter of the pipe (in inches). One standard outside pipe diameter is 4 inches.

a. Write a function for r and d using $D = 4$.

b. Graph the function and identify its domain and range.

c. If you want a pipe with a 4-inch outside diameter and a radius of gyration of 1.3 inches, what must its inside diameter be? Round your answer to the nearest tenth.