PRACTICE & PROBLEM SOLVING

Scan for Multimedia



UNDERSTAND

- 11. Communicate Precisely What is the domain and range of the radical function $h(x) = \sqrt{x + a} + b$? Is the function increasing or decreasing? Explain.
- **12. Model with Mathematics** The graph of a cube root function has a horizontal translation that is three times the vertical translation. The vertical translation is negative.
 - a. Write a function, g, that has these attributes.
 - **b.** Graph your function and the parent function, *f*, to verify it is correct.
- **13. Error Analysis** Helena is trying to write a radical function that is represented by the graph below. Describe and correct the error Helena made in writing the radical function.



- **14.** Higher Order Thinking Rewrite the radical function $g(x) = \sqrt[3]{8x + 64} 3$ to identify the transformations from the parent graph of $f(x) = \sqrt[3]{x}$. Explain how you rewrote the radical function.
- **15.** Reason The parent function $f(x) = \sqrt{x}$ and a transformation of the parent function, g(x), are reflections of each other over the *x*-axis. Write the function g(x).
- **16. Mathematical Connections** How do the transformations of a radical function compare to the transformations of an absolute value function?

PRACTICE

Graph the following functions. State the domain and range. Is the function increasing or decreasing? SEE EXAMPLE 1

17. $T(X) = \sqrt{X} + 2$ 18. $T(X) = \sqrt{X} - 4$	17. $f(x) = \sqrt{x} + \frac{1}{2}$	2 18.	$f(x) = \sqrt[3]{x} - 4$
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- **19.** $f(x) = \sqrt[3]{x-8}$ **20.** $f(x) = \sqrt{x+6}$
- **21.** Graph $f(x) = \sqrt[3]{x}$ and $g(x) = \sqrt[3]{x+9} 8$. What transformations of the graph of *f* produce the graph of *g*? What effect do the transformations have on the domain and range of *g*? SEE EXAMPLE 2

Rewrite the following radical functions to identify their transformations from the parent graph $f(x) = \sqrt{x}$. SEE EXAMPLE 3

$(x) = \sqrt{x}$. SEE EXAMPLE S	
22. $f(x) = \sqrt{16x}$	23. $f(x) = \sqrt{25x + 75}$
24. $f(x) = \sqrt{9x - 45}$	25. $f(x) = \sqrt{4x - 24} - 6$

What radical function is represented in each graph? SEE EXAMPLE 4



- **28.** The hull speed, *y*, measured in knots, of a sailboat can be estimated by the function $y = 1.34\sqrt{x}$, where *x* is the waterline length of the sailboat, in feet. Luis works at a sailboat rental business with boats that have a waterline length between 25 ft and 64 ft. SEE EXAMPLE 5
 - a. Graph the relationship between the hull speed of a sailboat and its waterline length.
 - b. What are the minimum and maximum hull speeds of the sailboats at the rental business?



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APPLY

29. Make Sense and Persevere The radius of a sphere can be found using the function $r = \sqrt[3]{\frac{3v}{4\pi}}$, where V is the volume of the sphere. Heather filled a basketball with 448.92 in.³ of air.



- a. Graph the function.
- **b.** Identify the domain and range of the graph.
- c. Do the domain and range make sense in this context? Explain.
- d. What is the length of the radius of the basketball?
- 30. A formula for calculating the distance to the horizon is $d = \sqrt{\frac{h}{0.57}}$, where *d* is the distance to the horizon, in miles, and *h* is the height above the surface, in feet.



- a. Graph the function.
- b. Reason What is your height above the surface if you can see a distance of 5 mi to the horizon?

ASSESSMENT PRACTICE

31. Choose yes or no to tell whether the function is an odd function.

a.	$f(x)=5\sqrt{x-10}-12$	0	Yes	0	No
b.	$f(x)=\frac{1}{4}\sqrt[3]{x}$	0	Yes	0	No
c.	$f(x)=\frac{1}{2}\sqrt{x+8}-1$	0	Yes	0	No
d.	$f(x) = 6\sqrt[3]{x}$	0	Yes	0	No
e.	$f(x)=9\sqrt[3]{x-7}+8$	0	Yes	0	No

32. SAT/ACT Which function has a graph with domain $x \ge -1$ and range $y \ge -2$?

$f(x) = \sqrt{x-1} + 2$	(
$\bigcirc f(x) = \sqrt[3]{x-1} + 2$	

33. Performance Task The table shows the domain and range of the function $f(x) = \sqrt[n]{x}$ for different values of n, where x is a positive real number.

n	Domain of $f(x) = \sqrt[\eta]{x}$	Range of $f(x) = \sqrt[n]{x}$
1	All real numbers	All real numbers
2	$x \ge 0$	$y \ge 0$
3	All real numbers	All real numbers
4		
5		
6		
7		
8		

Part A Identify the domain and range of the function $f(x) = \sqrt[n]{x}$ when n = 4, 5, 6, 7, and 8.

Part B Make a conjecture about the values of *n* that gives a domain and range of all real numbers.

Part C Make a conjecture about the values of *n* that gives a domain of $x \ge 0$ and a range of $y \ge 0$.