Name: _____ Date: _____

SQUARE ROOT FUNCTIONS AND SHIFTING
COMMON CORE ALGEBRA I

Square roots are operations on numbers that give exactly one output for a given input. So, they fit nicely into the definition of a function. We can graph the general square root function, once we establish a **very important fact about square roots**.

***Exercise* #1:** Consider $\sqrt{-4}$?

(a) Why are neither 2 nor -2 the correct square root of -4?

(b) What can you conclude about taking square roots of negative numbers? Explain

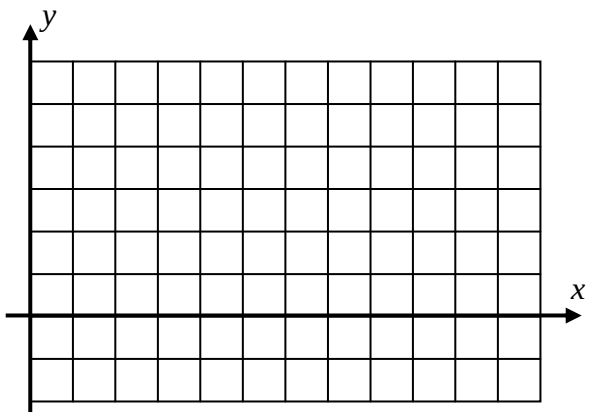
It is absolutely critical that you understand, deep down inside, why **finding the square root of a negative number** is **not possible** with any **real number**. Let's now get into the basic square root graph.

***Exercise* #2:** Consider $f(x)=\sqrt{x}$.

(a) Create a table of values for input values of x for which you can find rational square roots.

x				
$f(x)=\sqrt{x}$				

(b) Graph the function on the grid provided.



(c) What is the domain of this function?

(d) What is the range of this function?

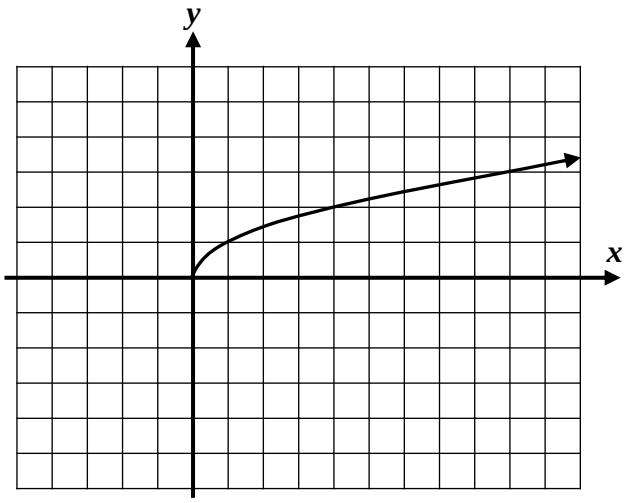
(e) Circle the correct choice below that characterizes $f(x)=\sqrt{x}$.

$f(x)$ is always decreasing $f(x)$ is always increasing

(f) What shape does the square root graph appear to be "half" of? **This is not a coincidence.**

Square root graphs can be shifted just as quadratics can. And they shift in much the same way.

***Exercise* #3:** The graph of $y = \sqrt{x}$ is shown below.



(a) Using your calculator, graph the function given by $y = \sqrt{x+4} + 2$. Show your table of values.

(b) State the domain and range of this function.

Domain:

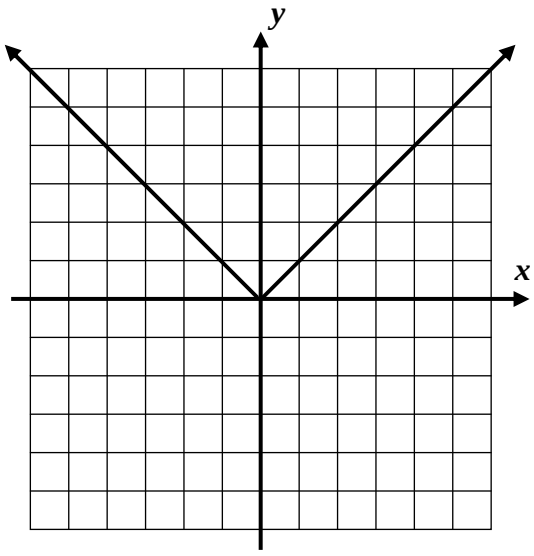
Range:

(c) Using your calculator, graph the function given by $y = \sqrt{x-1} - 4$. Show your table. Also state its domain and range.

Table Domain: Range:

So, it looks like our the shifting pattern that we saw with quadratics continues to hold with square root functions. This pattern would in fact hold no matter what function we were looking at. For example, let's look back at our friend the absolute value function.

***Exercise* #4:** The graph of $y = |x|$ is shown on the grid below.



(a) Use your calculator to create a graph of $y = |x+3| - 2$.

(b) State the domain and range of this function:

Domain: Range:

(c) Let's see if you get the pattern. Sketch $y = |x-2| - 1$ without using your calculator.

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SQUARE ROOT FUNCTIONS AND SHIFTING
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FLUENCY

1. Given the function $f(x)=\sqrt{x-8}+3$, which of the following is the value of $f(24)$?

   (1) 7 (3) 3

   (2) 11 (4) 4

2. If $g(x)=4\sqrt{x}$ then $g(45)$ is

   (1) $7\sqrt{5}$ (3) $36\sqrt{5}$

   (2) $12\sqrt{5}$ (4) $22\sqrt{5}$

3. Which of the following values of *x* is *not* in the domain of $y=\sqrt{x-8}$? Remember, the domain is the set of all inputs (*x*-values) that give an real output (*y*-value)?

   (1) $x=12$ (3) $x=8$

   (2) $x=10$ (4) $x=7$

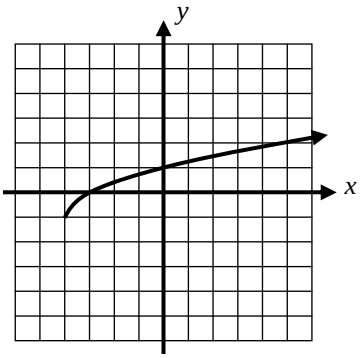
4. Which of the following is the equation of the square root graph shown below?

   (1) $y=\sqrt{x+4}+1$

   (2) $y=\sqrt{x+4}-1$

   (3) $y=\sqrt{x-4}-1$

   (4) $y=\sqrt{x-4}+1$



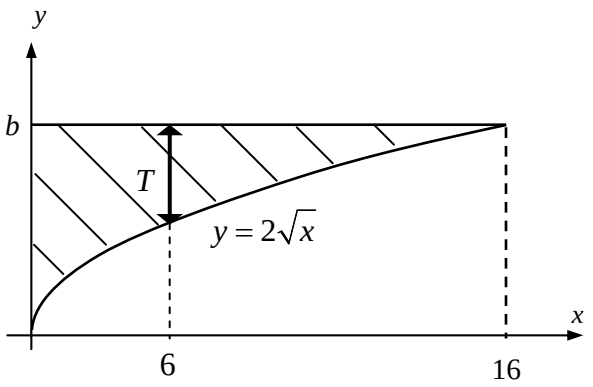
5. Which of the following gives the range of the function $y=|x-1|+7$? Hint: Create a sketch by hand or on your calculator to help solve this problem.

   (1) $y\le 1$ (3) $y\ge 7$

   (2) $y\ge 1$ (4) $y\le 7$

APPLICATIONS

6. The bottom edge of a 16-foot long cantilever is given by the equation $y = 2\sqrt{x}$, where *y* is the distance the bottom edge is from ground height, in feet.

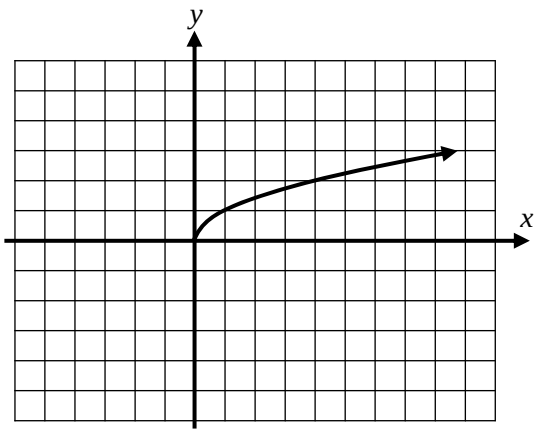


(a) What is the value of *b*, the height of the cantilever, in feet?

(b) To the nearest *tenth* of a foot, what is the thickness, *T*, of the cantilever at $x = 6$ feet?

REASONING

7. On the grid shown to the right, $y = \sqrt{x}$ is graphed. Without using your calculator, create a table and graph $y = -\sqrt{x}$ on the same set of axes.



x	0	1	4	9
$y = -\sqrt{x}$				

Explain the effect on the graph of $y = \sqrt{x}$ by multiplying by -1.

8. Graph the function $f(x) = -\sqrt{x+3} + 2$ on the grid below. Show the table that you created by hand or using your calculator. Then, state its domain and range.

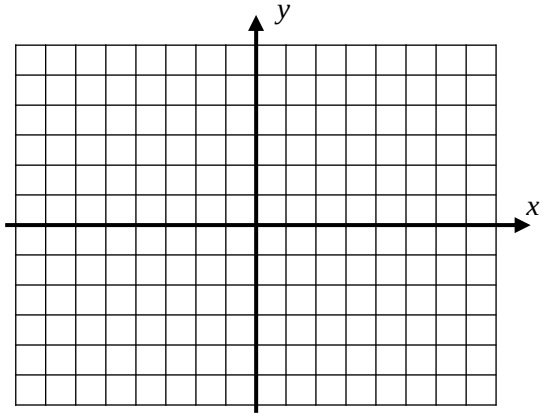


Table:

Domain: Range: