Algebra 1

Lesson 11.1

Graph Square Root Functions

Warm-Up

Fill out the information from page 710 that introduces the new vocabulary (radical expression, radical function, square root function, parent square root function):

KEY CONCEPT *For Your Notebook*

Graphs of Square Root Functions

To graph a function of the form $y = a\sqrt{x - h} + k$, you can follow these steps.

STEP 1 **Sketch** the graph of $y = a\sqrt{x}$. The graph of $y = a\sqrt{x}$ starts at the origin and passes through the point $(1, a)$.

STEP 2 **Shift** the graph $|h|$ units horizontally (to the right if h is positive and to the left if h is negative) and $|k|$ units vertically (up if k is positive and down if k is negative).

GRAPHS OF SQUARE ROOT FUNCTIONS Examples 1 and 2 illustrate the following:

- When $|a| > 1$, the graph of $y = a\sqrt{x}$ is a vertical stretch of the graph of $y = \sqrt{x}$. When $0 < |a| < 1$, the graph of $y = a\sqrt{x}$ is a vertical shrink of the graph of $y = \sqrt{x}$.
- When $a < 0$, the graph of $y = a\sqrt{x}$ is the reflection in the x-axis of the graph of $y = |a|\sqrt{x}$.

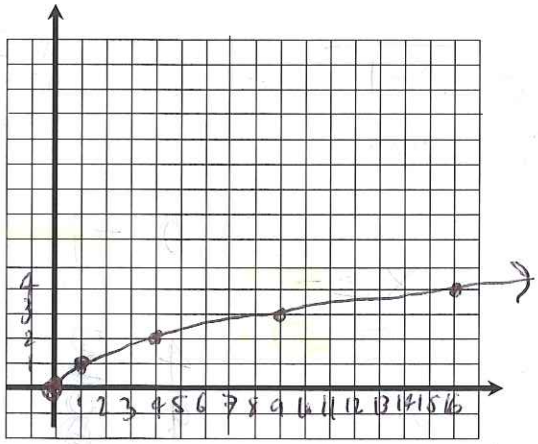
For each of the following functions: complete the table, graph each function, identify the domain and range, and compare it to the parent square root function.

1. $y = \sqrt{x}$

Domain: $x \geq 0$

Range: $y \geq 0$

x	y
0	0
1	1
4	2
9	3
16	4



2. $y = -2\sqrt{x}$

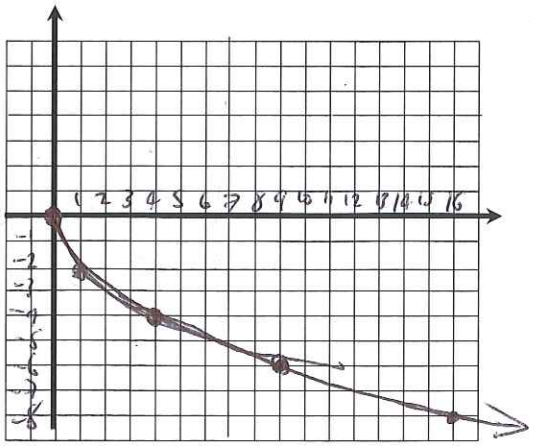
Domain: $x \geq 0$

Range: $y \leq 0$

Vertical stretch

Reflection over x-axis

x	y
0	0
1	-2
4	-4
9	-6
16	-8



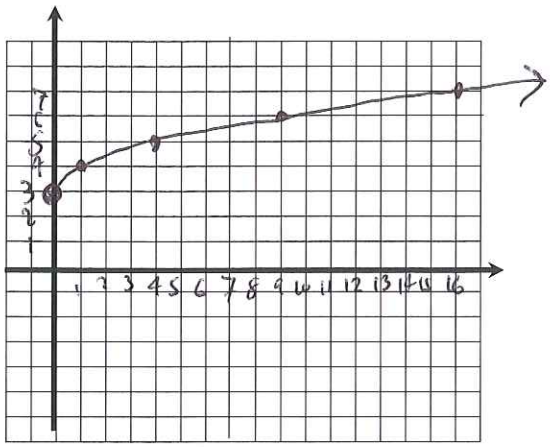
3. $y = \sqrt{x} + 3$

Domain: $x \geq 0$

Range: $y \geq 3$

vertical translation up 3

x	y
0	3
1	4
4	5
9	6
16	7



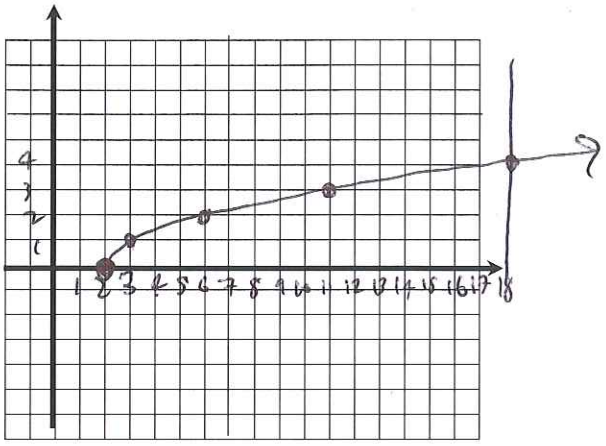
4. $y = \sqrt{x-2}$

Domain: $x \geq 2$

Range: $y \geq 0$

horizontal translation right 2

x	y
2	0
3	1
6	2
11	3
18	4



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

$a = 2$
$h = -1$
$k = -2$

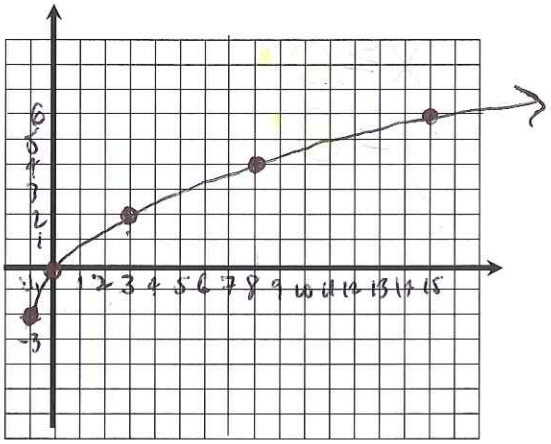
5. [illegible]

Domain: $x \geq -1$

Range: $y \geq -2$

- Vertical stretch
- Horiz. translation left 1
- Vert. translation down 2

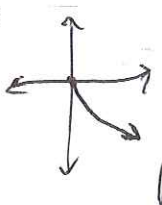
x	y
-1	-2
0	0
3	2
8	4
15	6



Try It!
Find the domain and range for each of the following square root functions. Sketch a graph to help you find the domain and range.

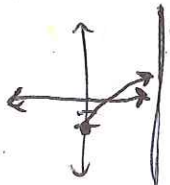
(a) $y = -4\sqrt{x}$

D: $x \geq 0$
R: $y \leq 0$



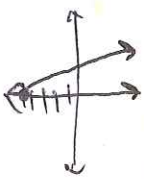
(b) $y = \sqrt{x} - 2$

D: $x \geq 0$
R: $y \geq -2$



(c) $y = \sqrt{x+5}$

D: $x \geq -5$
R: $y \geq 0$



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

D: $x \geq 4$
R: $y \geq 0$

Assignment
New: Pg. 713 #4,13,15,16,18,24,31,34