2.1 New

Thursday, June 29, 2023 10:15 AM

2.1 Radical Functions and Transformations

Radical Function: The function has a variable in the radicand. $y = \sqrt{3x+2}$ ← radicand

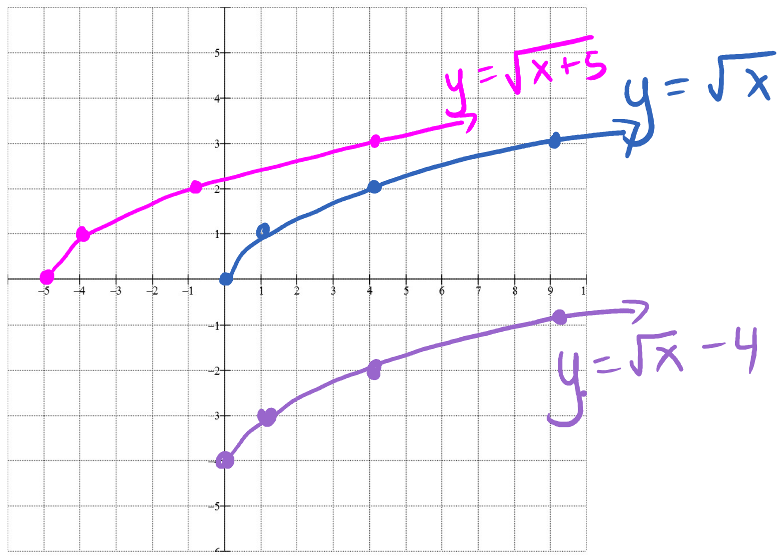
Example 1: Use a table of values to sketch the graph of each function. State the domain and range for each graph.

a) $y = \sqrt{x}$

x	y
0	0
1	1
4	2
9	3

Domain: $\{x \mid x \geq 0 \;\; x \in \mathbb{R}\}$

Range: $\{y \mid y \geq 0 \;\; y \in \mathbb{R}\}$



b) $y = \sqrt{x + 5}$

x	y
-5	0
-4	1
-1	2
4	3

Domain: $\{x \mid x \geq -5 \;\; x \in \mathbb{R}\}$

Range: $\{y \mid y \geq 0 \;\; y \in \mathbb{R}\}$

c) $y = \sqrt{x} - 4$

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

Domain: $\{x \mid x \geq 0 \;\; x \in \mathbb{R}\}$

Range: $\{y \mid y \geq -4 \;\; y \in \mathbb{R}\}$

Graphing Radical Functions using Transformations:

$$y = a\sqrt{b(x-h)} + k$$

a: vertical stretch factor of $|a|$, $a < 0$ reflection over x-axis

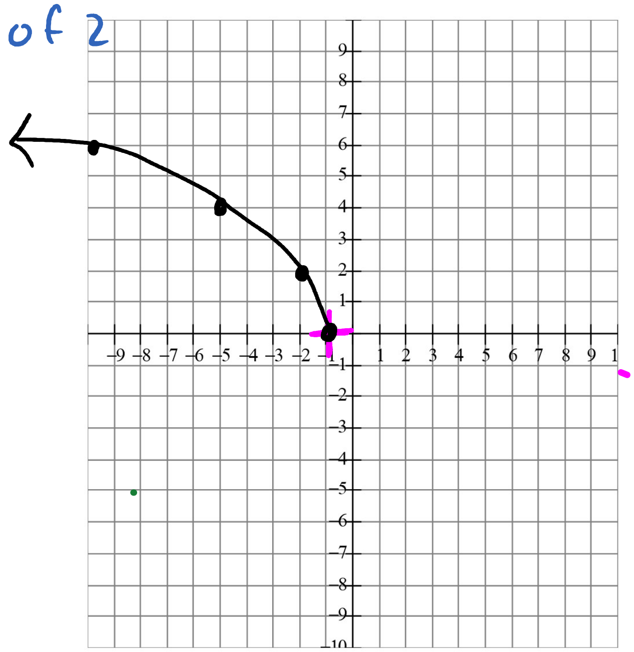
b: horizontal stretch factor of $\left|\frac{1}{b}\right|$, $b < 0$ reflection over y-axis

h: Horizontal translation

k: Vertical translation.

Example 2: Sketch the graph of the function $y = 2\sqrt{-(x+1)}$ using transformations. State the transformations.

- Vertical stretch factor of 2
- reflection over y-axis
- Horizontal translation left 1



$y = \sqrt{x}$

x	y
0	0
1	1
4	2
9	3

a = 2
Mult y's by 2

b = −1
Divide x's by (−1)

x	y
0	0
−1	2
−4	4
−9	6

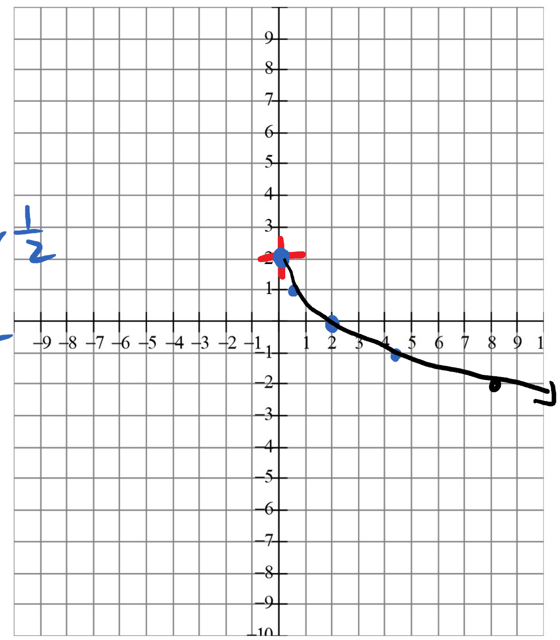
State the domain and range for the function:

Domain : $\{x \mid x \leq -1 \quad x \in \mathbb{R}\}$

Range : $\{y \mid y \geq 0 \quad y \in \mathbb{R}\}$

Ex. #3: Sketch the graph of the function $y-2=-\sqrt{2x}$ using transformtions. State the transformations

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



- Reflection over x-axis
- Horizontal stretch factor $\frac{1}{2}$
- Vertical translation up 2

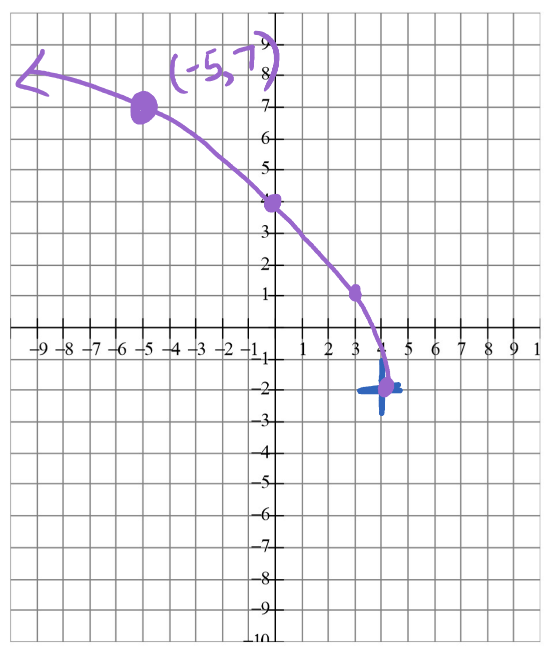
0	0
1	1
4	2
9	3
16	4

$a=-1$
Mult y's by (-1)

$b=2$
divide x's by 2

0	0
$0.5=\frac{1}{2}$	-1
2	-2
$4.5=\frac{9}{2}$	-3
8	-4

Ex. #4: Sketch the graph of the function $y=3\sqrt{-(x-4)}-2$ State the transformations.



- Vertical stretch factor 3
- Reflection over y-axis
- Horizontal translation right 4
- Vertical translation down 2

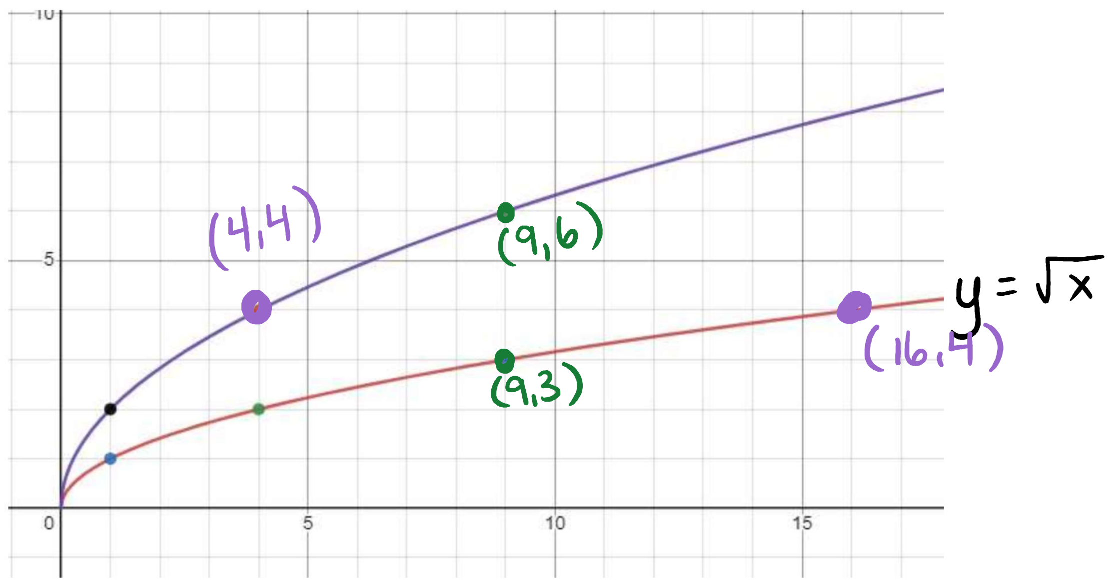
0	0
1	1
4	2
9	3

$a=3$
Mult y's by 3

$b=-1$
Divide x's by -1

0	0
-1	3
-4	6
-9	9

Example 5: State the equation for the given graph.



View as a vertical stretch

$$\boxed{\begin{array}{c} y = a\sqrt{x} \\ \text{New } (9,6) \end{array}} \quad \text{old } (9,3)$$

$$6 = a\sqrt{9}$$
$$6 = a(3)$$
$$6 = 3a$$
$$2 = a$$
$$y = 2\sqrt{x}$$

View as a horizontal stretch

$$\boxed{\begin{array}{c} y = \sqrt{bx} \\ \text{New } (4,4) \end{array}} \quad \text{old } (16,4)$$

$$4 = \sqrt{b \cdot 4}$$
$$4 = \sqrt{4b}$$
$$(4)^2 = (\sqrt{4b})^2$$
$$16 = 4b$$
$$4 = b$$
$$y = \sqrt{4x}$$

Show that the two equations are equal to each other

$$y = \sqrt{4x}$$
$$y = \sqrt{4} \cdot \sqrt{x}$$
$$y = 2\sqrt{x}$$

Practice: Pg 72 # 2-5, 10, 11, 16