Graphing Radical Functions

Function: each x has a uniquely y
→ vertical line test

Math 2 Unit 3 Day 2 Name: ____________

Graphing Square Root Functions

Make a table for each function. **Ignore any points with decimals.**

$f(x) = x^2$

x	f(x)
0	0
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81

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

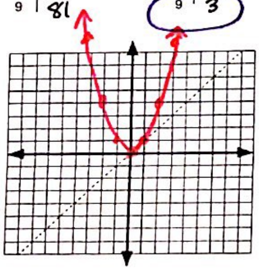
x	f(x)
0	0
1	1
~~2~~	~~1.414~~
~~3~~	~~1.732~~
4	2
~~5~~	~~2.236~~
~~6~~	~~2.45~~
~~7~~	~~2.64~~
~~8~~	~~2.828~~
9	3

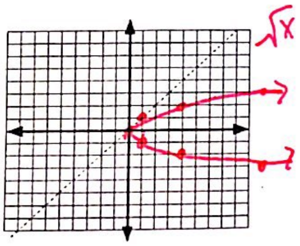
What do you notice about the other points? the pts flip

These functions are inverse of each other.

By definition, this means the domain and the range switch.

Plot the points from the tables above.





As a result, the graphs have the same numbers in their points but the x and the y coordinates have switch places.

This causes the graphs to have the same shape but to be Reflection over the line y=x.

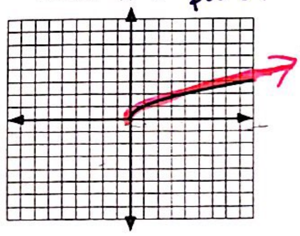
* x & y literally switch

The Square Root Function

Did you notice the problem with the square root graph above????
does not pass the vertical line test

We have to define the Square Root Function as absolute value (positive). This means that we will only use the top side of the graph.

The result: $f(x) = \sqrt{x}$ parent



Characteristics of the graph

Vertex (0,0)

End Behavior L→0 R→∞

Domain [0,∞)

Range [0,∞)

Symmetry NO

Pattern same as x^2 just reversed!

Transforming the Graphs

Now that we know the shapes we can use what we know about transformations to put that shape on the coordinate plane. Let's remind ourselves where to look for each of these types of transformations!

Translate

Left ← → Right
(+) (−)
$\sqrt{x+3}$ $\sqrt{x-3}$

Up ↑ (+) $\sqrt{x}+2$

Down ↓ (−) $\sqrt{x}-2$

Reflect

Reflect over x axis
$-\sqrt{x}$

$\sqrt{x}$

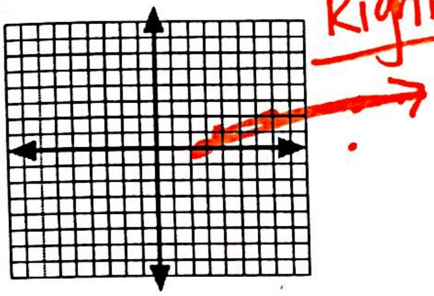
Reflection over y
$\sqrt{-x}$

Dilate

Stretch $a > 1$

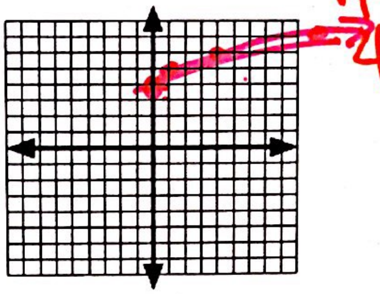
Shrink $a < 1$

1. f(x) = $\sqrt{x-3}$



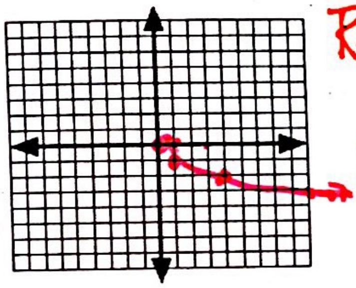
Right 3

2. f(x) = $\sqrt{x} + 4$



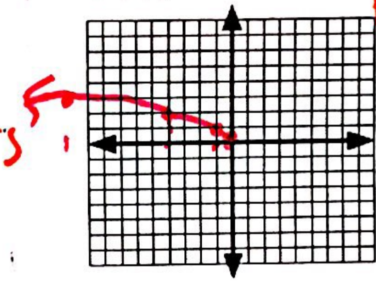
Up 4

3. f(x) = $-\sqrt{x}$



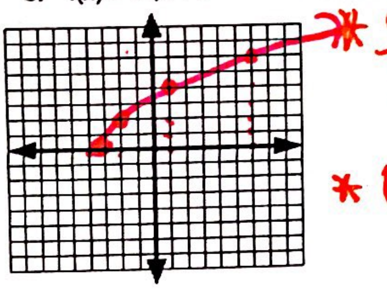
Reflect over x-axis

4. f(x) = $\sqrt{-x}$



Reflect over y-axis

5. f(x) = $2\sqrt{x+3}$

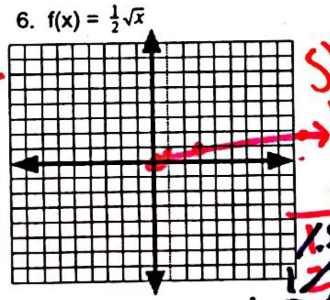


* stretch by 2

* Left 3

~~1~~ 2	1
~~2~~ 4	4
~~3~~ 6	9

6. f(x) = $\frac{1}{2}\sqrt{x}$



Shrink by 1/2

~~1~~ .5	1
~~2~~ 1	4
1.5 ~~3~~	9

Sometimes the functions are not in graphing form. We may have to use some of our algebra skills to transform the equations into something we can use.

Ex: f(x) = $\sqrt{4x-12}$

This is not in graphing form.

$\sqrt{4(x-3)}$

$\sqrt{4}\sqrt{x-3}$

$f(x)\ 2\sqrt{x-3}$

Right 3

Stretch by 2

Ex: f(x) = $\sqrt{9x+36} - 5$

This is not in graphing form.

$\sqrt{9(x+4)} - 5$

$\sqrt{9}\sqrt{x+4} - 5$

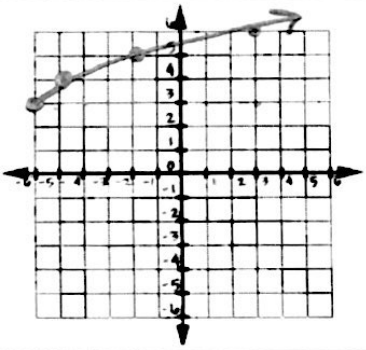
* $f(x) = 3\sqrt{x+4} - 5$

Stretch by 3 — Left 4 — Down 5

Name: ______________________ Date: __________

Graphing and Solving Square Root Functions

Graph: $y = \sqrt{x+6}$



Solve: $\sqrt{x+6} = 3$

$x + 6 = 9$

$x = 3$

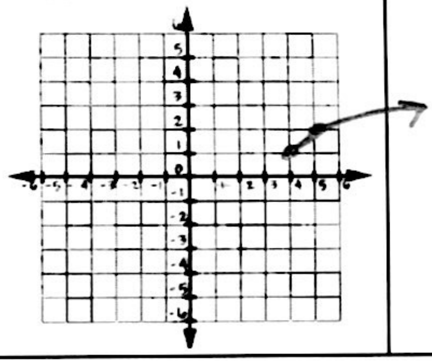
Is it extraneous?

NO

Interpret the Solution.

$3 = 3$

Graph: $y = \sqrt{x-4} - 1$



Solve: $\sqrt{x-4} - 1 = 0$

$\sqrt{x-4} = 1$

$x - 4 = 1$

$x = 5$

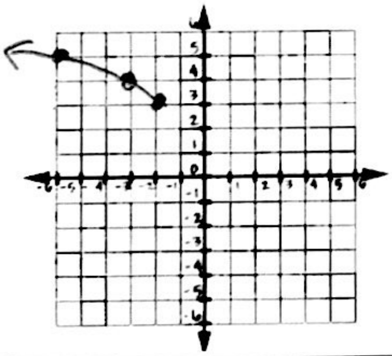
Is it extraneous?

NO

Interpret the Solution.

$0 = 0$

Graph: $y = \sqrt{-x+2} + 3$



Solve: $\sqrt{-x+2} + 3 = 5$

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

$-x + 2 = 4$

$-x = 2$

$x = -2$

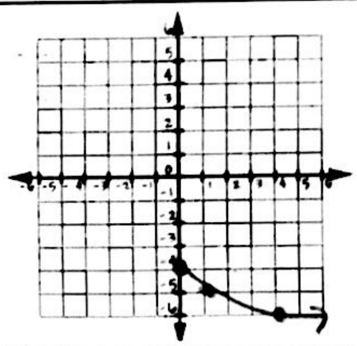
Is it extraneous?

NO

Interpret the Solution.

$5 = 5$

Graph: $y = -\sqrt{x} - 4$



Solve: $-\sqrt{x} - 4 = 5$

$-\sqrt{x} = 9$

$\sqrt{x} = -9$

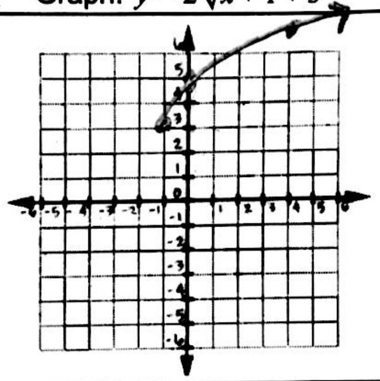
$x = 81$

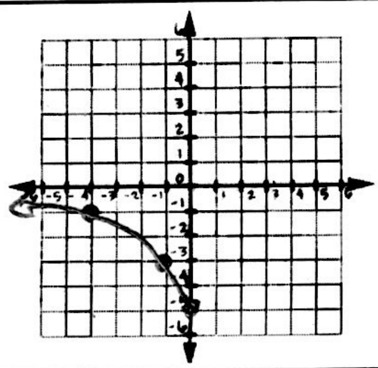
Is it extraneous?

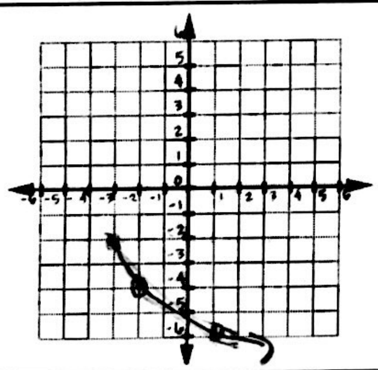
NO

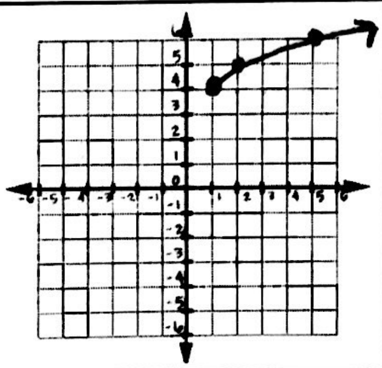
Interpret the Solution.

$5 = 5$

Graph: $y=2\sqrt{x+1}+3$	Solve: $2\sqrt{x+1}+3=1$	Is it extraneous?
	$2\sqrt{x+1}=-2$ $\sqrt{x+1}=-1$ $x+1=1$ $x=0$	YES **Interpret the Solution.** $5\neq 1$

Graph: $y=2\sqrt{-x}-5$	Solve: $2\sqrt{-x}-5=-1$	Is it extraneous?
	$2\sqrt{-x}=4$ $(\sqrt{-x})^2=(2)^2$ $-x=4$ $x=-4$	NO **Interpret the Solution.** $-1=-1$

Graph: $y=-2\sqrt{x+3}-2$	Solve: $-2\sqrt{x+3}-2=-4$	Is it extraneous?
	$-2\sqrt{x+3}=-2$ $\sqrt{x+3}=1$ $x+3=1$ $x=-2$	NO **Interpret the Solution.** $-4=-4$

Graph: $y=\sqrt{x-1}+4$	Solve: $\sqrt{x-1}+4=-3$	Is it extraneous?
	$(\sqrt{x-1})^2=(-7)^2$ $x-1=49$ $x=50$	YES **Interpret the Solution.** $11\neq -3$