Name Key

8A; Algebra 1

Date ____________

Period____________

Square Root Functions

Review the Square Shape (parent function)

We can use the square ($y=x^2$) shape to remember the square root ($y=\sqrt{x}$) shape because they have a very similar pattern.

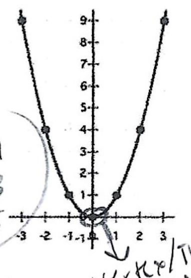
$y = x^2$

Do you remember the "parabola pattern?"

It's the vertical increase of 1, 3, 5, ... each time we take a step left or right of the vertex. You see it in the table and in the graph.

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

+1, +1, +1 ; +1, +3, +5



The Basic Square Root Shape

(parent function)

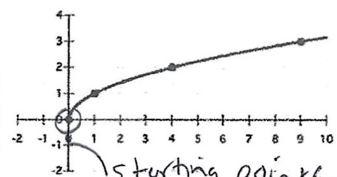
The shape of the basic square root function is literally "half of a parabola on its side."

A table of the key points looks exactly like a table for the square function, with the values of x and y reversed!

$y = \sqrt{x}$

x	$\sqrt{x}$
0	0
1	1
4	2
9	3

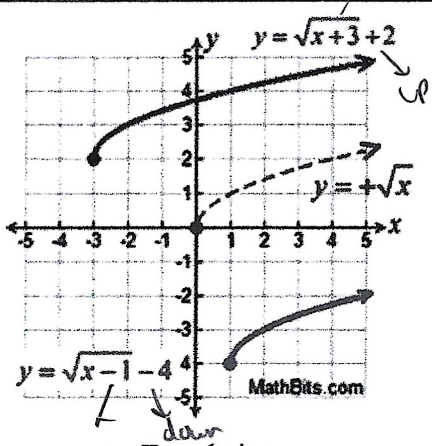
+1, +3, +5 ; +1, +1, +1



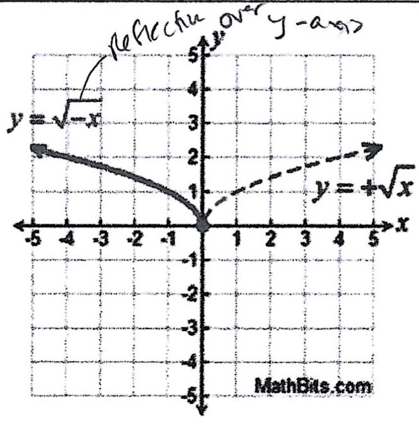
The 1, 3, 5, ... pattern is shown in the x-values of the table and horizontal change in the graph.

(0,0)

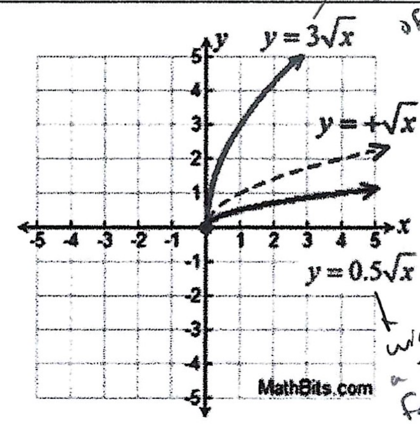
Square Root Function – Transformation Examples:



Translations



Reflection



Vertical Stretch/Shrink

Radical Functions are of the form $f(x)=a\sqrt{bx+c}+d$.

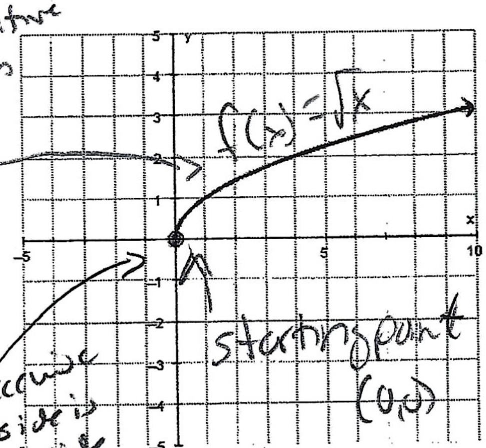
To graph a radical function, we will use tables for the most part. The biggest challenge is to find the x-values to pick. You want to find convenient x-values that lie in the domain of the function.

$x \geq 0$ y: Rational square roots

The Domain of $f(x)=a\sqrt{bx+c}+d$ is $bx+c\geq 0$. → No Negative Radicands

Constraint

The parent function for a radical equation is $f(x)=\sqrt{x}$.



This parent function can be stretched, shifted and flipped similarly to a quadratic function $f(x)=a(bx+c)^2+d$.

a: The vertical stretch or flip.

$bx+c$: The horizontal position (stretch or shift).

d: The vertical shift.

like piecewise where 1 side is a dot & 1 side is an arrow.

Complete the following tables and graph each function.

1) $f(x)=3\sqrt{x}$, by a scale factor of 3   **Domain:** $x\geq 0$ → starting x-value (No neg radicands) Constraint: starting x-value

narrower? will always match

y=f(x) stretched vertically or Horizontally compressed

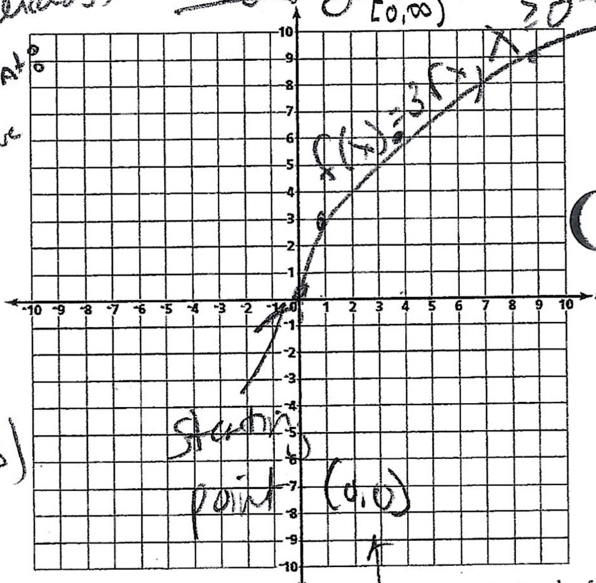
x	$3\sqrt{x}$	y
0	$3\sqrt{0}$	0
1	$3\sqrt{1}$	3
4	$3\sqrt{4}$	6
9	$3\sqrt{9}$	9

+1, +3, +5

* Copy only whole #s / Integers (No decimals)
* Copy rational square roots

Range: $y\geq 0$ or $[0,\infty)$

The constraint is why 1 side has a dot. ≥ 0



2) $f(x)=-\sqrt{x}$ **Domain:** $x\geq 0$ → constraint

Reflection in the x-axis will match

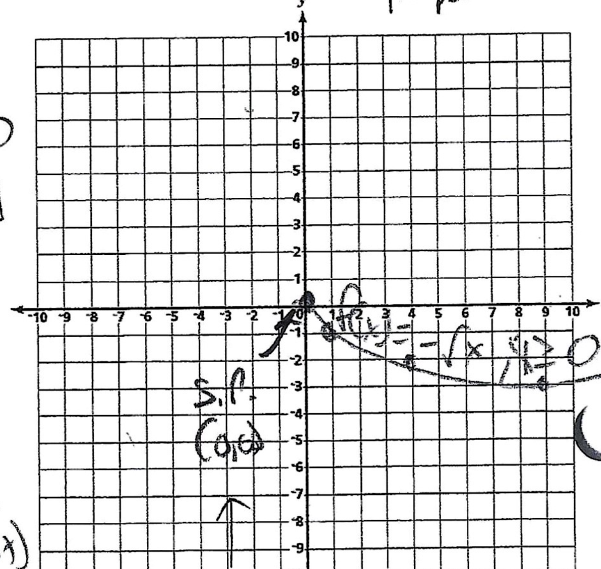
y=f(x)

x	$-\sqrt{x}$	y
0	$-\sqrt{0}$	0
1	$-\sqrt{1}$	-1
4	$-\sqrt{4}$	-2
9	$-\sqrt{9}$	-3

+1, +3, +5

Range: $y\leq 0$ OR $(-\infty,0]$

* y-values can be negative
* Only copy whole # / Int
* Copy rational square roots



3) $f(x)=\sqrt{x+3}$ Domain: $x+3 \geq 0$ → B/c you can't have a neg. radicand

Translated 3 units left from (0,0)

$-3 \quad -3$

$x \geq -3$ → constraint

★ write this form of the constraint on the graph

will match = starting value

$y=f(x)$

Range: $y \geq 0$ or $[0, \infty)$

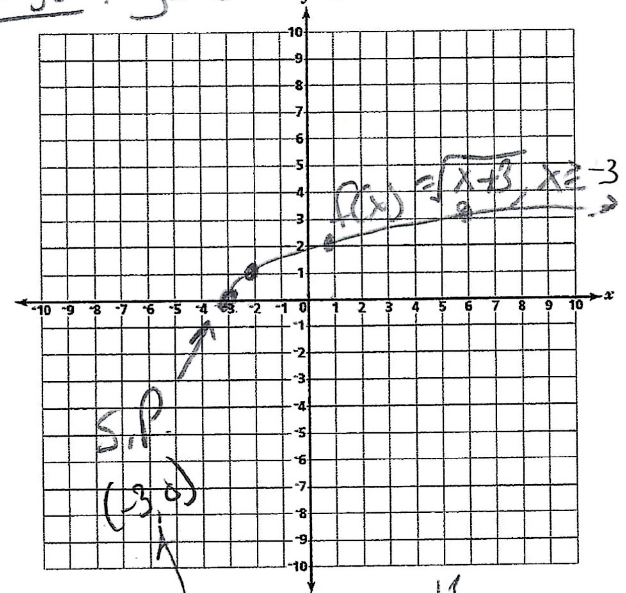
x	$\sqrt{x+3}$	y
-3	$\sqrt{-3+3}$	0
-2	$\sqrt{-2+3}$	1
1	$\sqrt{1+3}$	2
6	$\sqrt{6+3}$	3

+1, +3, +5

copy whole #'s / Integers

★ No decimals

★ copy rational square roots



4) $f(x)=\sqrt{x}-6$ Domain: $x \geq 0$ → constraint

B/c you can't have: $\sqrt{-x}$

Translated 6 units down from (0,0)

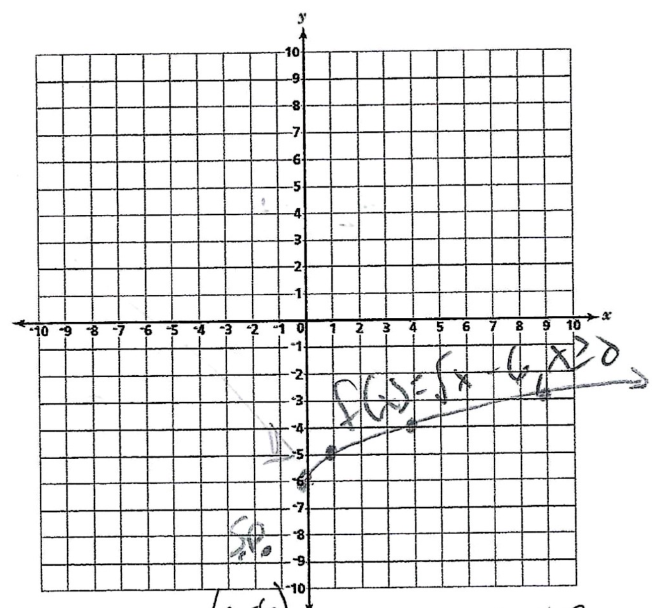
will match

X	f(x)
0	-6
1	-5
4	-4
9	-3

+1, +3, +5

Range: $y \geq -6$ or $[-6, \infty)$

- Copy: whole #'s / Integers
- Don't copy decimals
- ★ copy rational square roots



5) $f(x)=\sqrt{x+2}-6$

Domain: $x+2 \geq 0$ → B/c you can't have a Neg radicand

$-2 \quad -2$

$x \geq -2$ → Constraint

Translated 2 units left & 6 units down from (0,0)

X	f(x)
-2	-6
-1	-5
2	-4
7	-3

+1, +3, +5

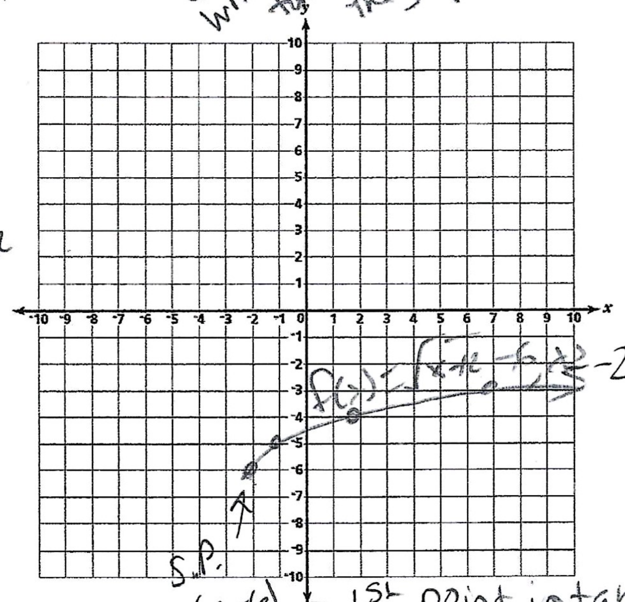
will match!

Range: $y \geq -6$ or $[-6, \infty)$

Copy: whole #'s / Integers

- Don't copy decimal
- Copy rational square root

★ write this form on the graph



(-2,-6) → 1st point in table

6) $f(x)=\sqrt{-2x}$

Reflection in the y-axis

Domain: $-2x \geq 0$

$-2 \quad -2$

$x \leq 0$

switch direction when dividing by a neg #

B/c when you multiply a Neg # by a Neg # the radicand will be positive

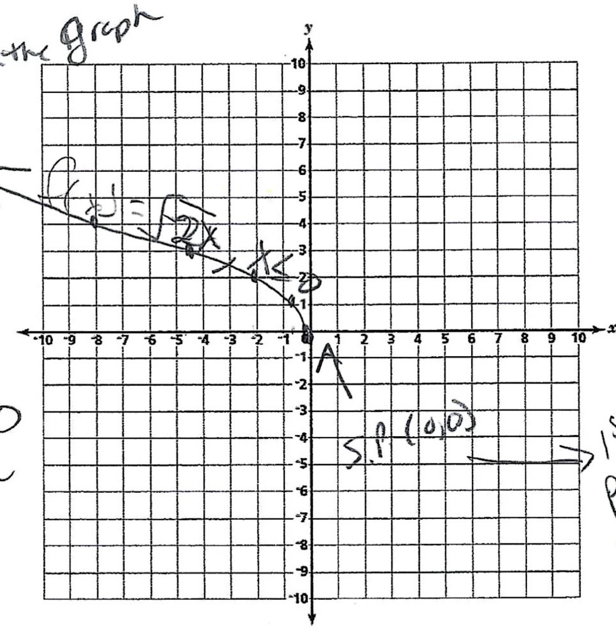
★ Constraint write this form on the graph

will match

y = f(x)

x	$\sqrt{-2x}$	y
0	$\sqrt{-2(0)}$	0
$-\frac{1}{2}$	$\sqrt{-2(-\frac{1}{2})}$	1
-2	$\sqrt{-2(-2)}$	2
$-\frac{9}{2}$	$\sqrt{-2(-\frac{9}{2})}$	3
-8	$\sqrt{-2(-8)}$	4

Range: $y \geq 0$ or $[0, \infty)$



S.P. (0,0) → 1st point in table

Copy: whole #'s / Integers

★ Don't copy decimals

★ Copy rational square root