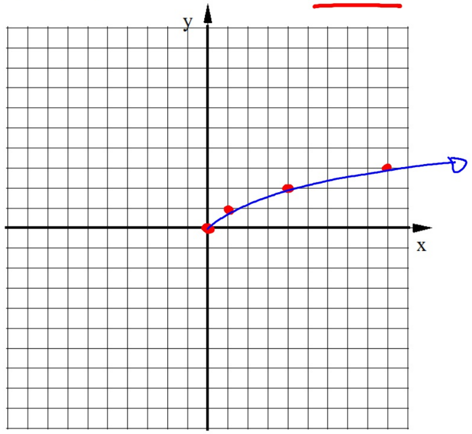
Graph the following using graph paper and at least four points.

$$y = \sqrt{x}$$

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




You only want to use perfect squares for x, otherwise, you would have to round values and estimate their location on the graph.

How are the values in the tables for these two related?

$$y = x^2$$

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

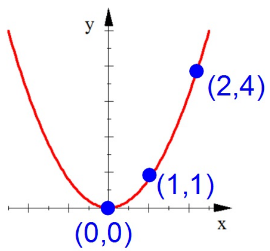
$$y = \sqrt{x}$$

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

The x's and y's are switched!

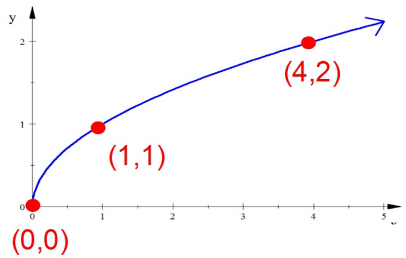
The parent quadratic:

$$y = x^2$$




The parent sq root:

$$y = \sqrt{x}$$

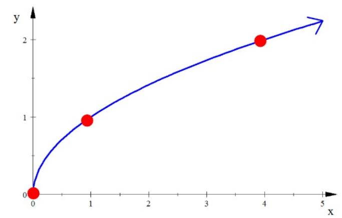



Since these two functions are inverses the coordinates of one can be found by switching the x and y coordinates of the other one.

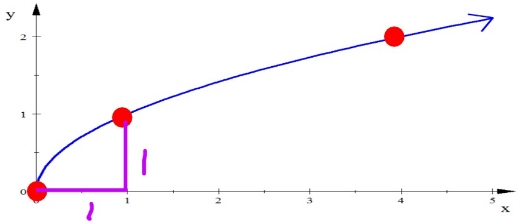
The graph of the Parent Square Root Function: $y = \sqrt{x}$

The graph of a square root doesn't have a Vertex

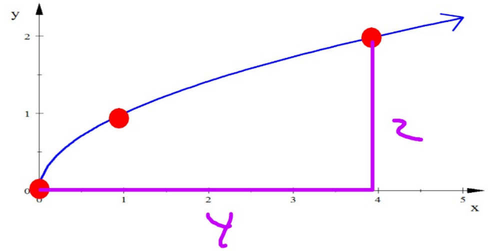
Starting Point is: (0,0)



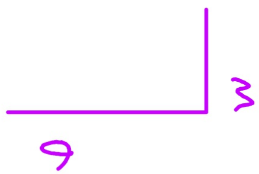
## First "Good Point"



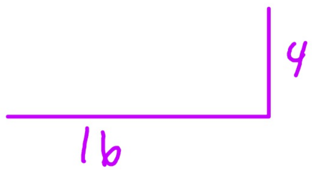

## Second "Good Point"




## Third "good point"




## Fourth "good point"




The graph of $y = \sqrt{x}$ is only half of a sideways parabola because

- $\sqrt{x}$ means the Principal (positive) Square Root which would be the top half of the sideways parabola.
- An entire sideways parabola would NOT be a function and the graphing calculator can only graph functions.

Describe what transformations each equation models:

$$y = 2(x-5)^2 + 7$$

2 2 times taller (vertical stretch factor of 2)

-5 moved 5 units right

+7 moved 7 units up

$$y = -\frac{1}{2}|x+6| - 8$$

-1/2 half as tall (vertical shrink factor)
Upside down (x-axis reflection)

+6 moved 6 units left

-8 moved 8 units down

What do you think $y = \sqrt{x-3}$ looks like?

The parent function shifted 3 units right

What do you think $y = \sqrt{x} + 7$ looks like?

The parent function shifted 7 units up

What do you think $y = -\sqrt{x}$ looks like?

The parent function upside down

What do you think $y = 3\sqrt{x}$ looks like?

The parent function 3 times taller

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

h: Horizontal Translation

k: Vertical Translation

a: a>1 Vertical Stretch

0<a<1 Vertical Shrink

a <0: x-axis reflection (upside down)

The new starting point
or
The new origin

(h,k)

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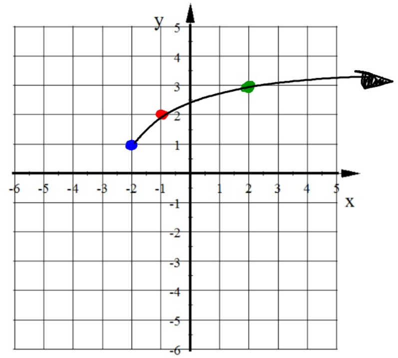
Graph each using three points. Include an arrow to indicate which direction the graph continues.

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

2 left & 1 up

START AT: (-2,1)



No vertical stretch or shrink & no reflection. 1st & 2nd "good points" are the same as the parent function.

1st good pt

2nd good pt

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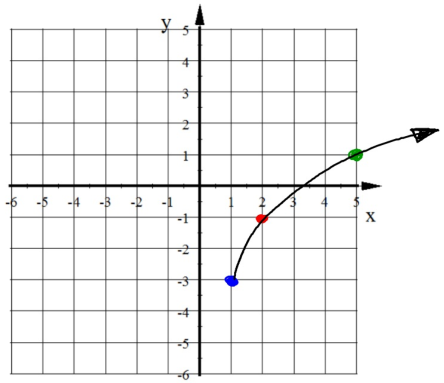
Graph each using three points. Include an arrow to indicate which direction the graph continues.

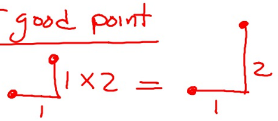
$y = 2\sqrt{x-1} - 3$

1 RT 3 down:
START AT (1,-3)

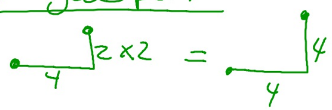


2 times taller:

1st good point



2nd good point



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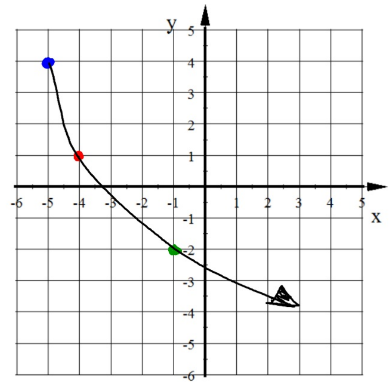
Graph each using three points. Include an arrow to indicate which direction the graph continues.

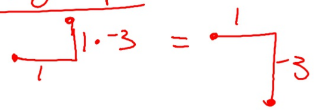
$y = -3\sqrt{x+5} + 4$

5 left 4 up:
START AT (-5,4)

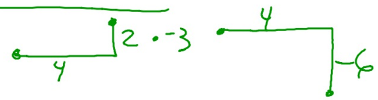


3 times taller and upside down (x-axis refl)

1st good pt



2nd good pt:



When we graphed parabolas we

- shifted them left, right, up and down
- made them taller and shorter
- made them upside down (x-axis reflection)

What didn't we do?

make them backwards (y-axis reflection)

Why not?

Since a parabola is already symmetric about a vertical line a y-axis reflection won't change it.

Since $y = \sqrt{x}$ isn't symmetric about the y-axis you can make it backwards.

If an upside down square root (x-axis reflection) is:

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

A backward square root function (y-axis reflection) is:

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

Write the equation of the parent square root function after a y-axis reflection, a vertical stretch factor of 5, vertical translation 9 units down, and an x-axis reflection.