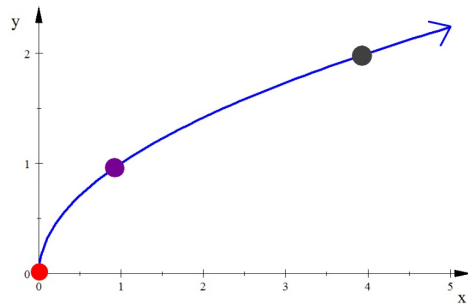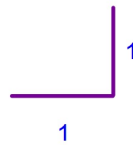## Panel 1

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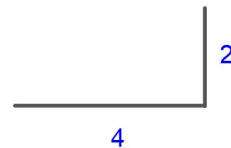
$$y = \sqrt{x}$$

First "Good Point"

1

1

Second "Good Point"

2

4

Panel 2

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

The "vertex"

(h,k)

h: Horizontal Translation

k: Vertical Translation

The new starting point
or
The new origin

a: a>1 Vertical Stretch

0<a<1 Vertical Shrink

a is neg: x-axis reflection
(upside down)

Panel 3

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

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

No vertical
stretch or shrink
& NO x-axis reflection

START AT
(-2,1)

1ST PT parent: __|1

1ST PT this graph __|1

2nd PT parent: __|2
              4

2nd PT this graph: __|2
                  4

Panel 4

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

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

2x
taller

START
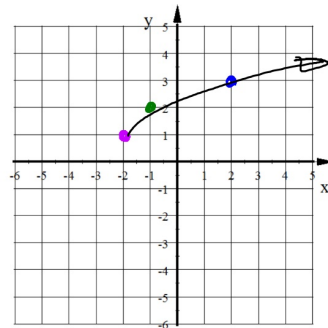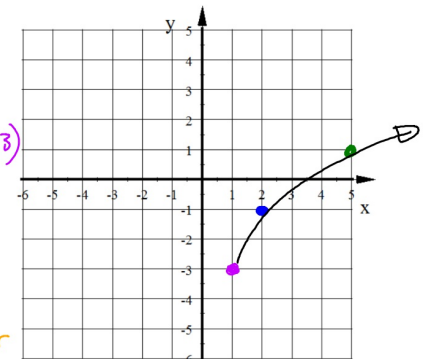AT (1,-3)

1ST PT parent: __|1
             1

1ST PT this graph: __|2
                 1
              2x taller

2nd pt parent: __|2
             4

2nd pt this graph __|4 ← 2x taller
                 4

Graph each using three points. Include an arrow to indicate which direction the graph continues.
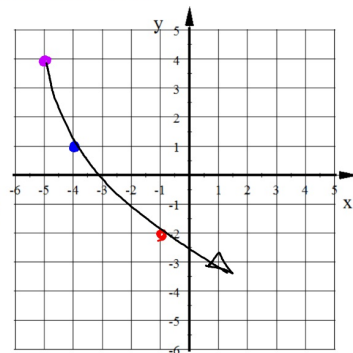
$$y = -3\sqrt{x+5} + 4$$

upside down

3x taller

START AT $(-5, 4)$

1ST PT parent: $\left.\dfrac{}{}\right]1$

1ST PT this graph: $\left.\dfrac{1}{}\right]-3$ ← 3x taller & upside down

2nd point Parent: $\left.\dfrac{}{4}\right]2$

2nd point this graph: $\left.\dfrac{4}{}\right]-6$

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.
How do you do a y-axis reflection?
    To graph a backward square root function:

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

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.
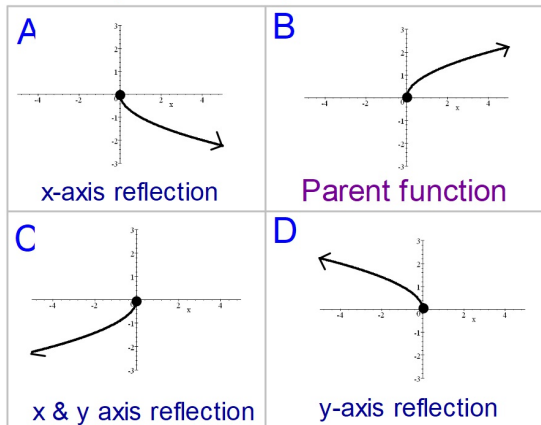
$$y = -5\sqrt{-x} \; -9$$

Write the equation of the parent square root function after a y-axis reflection and moving it 3 left.

When you have both a Horizontal Translation and a y-axis reflection you must use PARENTHESES to separate the two transformations

$$y = \sqrt{-(x+3)}$$

The shapes of the square root function:

A	B
x-axis reflection	Parent function
C	D
x & y axis reflection	y-axis reflection

Match the graphs with the equations

C 1. $y = -\sqrt{-x}$

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

A 3. $y = -\sqrt{x}$

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

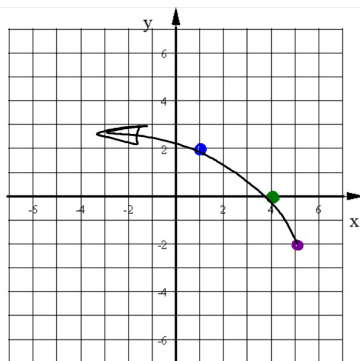Graph this square root function

$$y = 2\sqrt{-(x-5)} - 2$$

2x taller

Backwards

START AT (5,-2)

1ST PT parent: ___|1
                 1

1ST PT this graph
2x taller → 2|___
             1
← Backwards (left)

2nd pt parent: ___|2
                 4

2nd pt this graph 4|___
2x taller   4 ← Backwards

Graph this square root function

$$y = -4\sqrt{-(x+2)} + 6$$

upside down

4x taller

Backwards

START AT (-2,6)

1ST PT parent: ___|1
                 1

1ST PT this graph
upside down
& 4x taller → 4|___ 1
(down 4)   Backwards (Left)

2nd pt parent: ___|2
                 4

2nd pt this graph: 8|___ 4 ← Backwards
upside down 4x taller
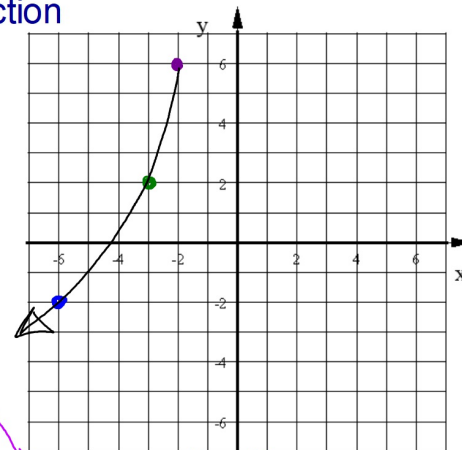
Write the equation of this function

upside down and 2x taller

$y = -2\sqrt{x-3} - 4$

parent: $\dfrac{1}{1}$ ①

this graph: $\dfrac{1}{-2}$ ②

$a = \dfrac{-2}{1} = -2$

(3,-4) (h,k)

-2
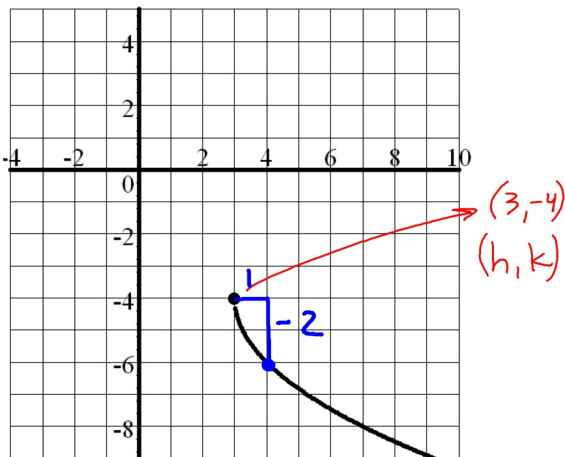
Write the equation of this function

$y = \sqrt{-(x+2)} + 3$

Backwards

parent: $\dfrac{1}{1}$ ①
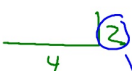
this graph ①

$a = \frac{1}{1} = 1$

(-2,3) (h,k)
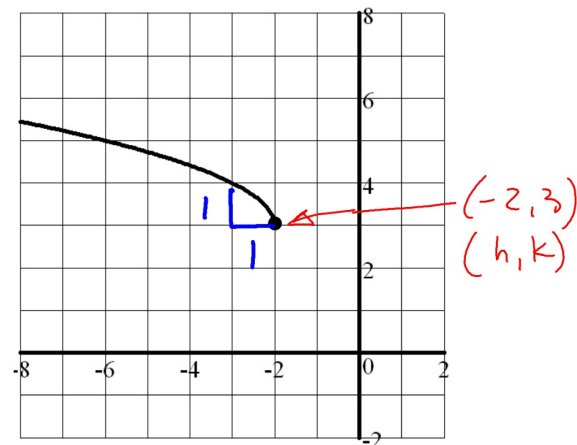
Write the equation of this function

upside down & half as tall

$y = -\dfrac{1}{2}\sqrt{-(x-5)} + 2$

Backwards

Parent $\dfrac{1}{4}$ ②

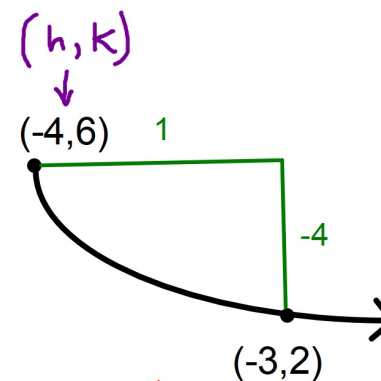this graph $\dfrac{4}{-1}$

$a = \dfrac{-1}{2}$

(5,2) (h,k)

4 -1

Write the equation of this function

(h,k)

(-4,6) 1

$y = -4\sqrt{x+4} + 6$

parent: $\dfrac{1}{1}$ ①

this function $\dfrac{1}{-4}$ ④ $a = \dfrac{-4}{1} = -4$

-4

(-3,2)
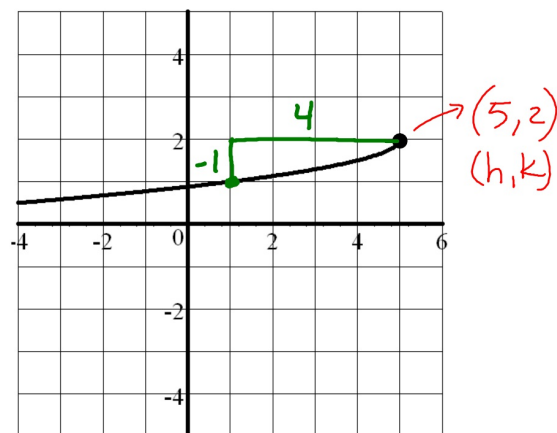
Domain and Range of Square Root Functions:

You can find the domain and range of a square root function by sketching a graph and using this to find the domain and range.
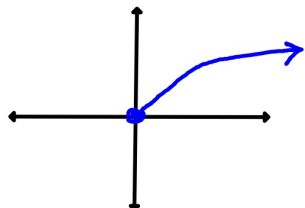
Parent Square Root function:　　$y = \sqrt{x}$

Starts at the origin and goes up and to the right forever.

Domain: $[0,\infty)$

Range: $[0,\infty)$

The domain and range of all square root functions will look similar to this.

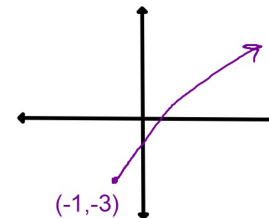Find the domain and range:　1. $y = 2\sqrt{x+1} - 3$

Make a sketch of the function:

Starts at (-1,-3) and graphs looks like parent function (moves up and to the right)

Domain: $[-1,\infty)$

starts at -1 and goes to the right forever

Range: $[-3,\infty)$

starts at -3 and goes up forever

(-1,-3)

You can now do Hwk #4

Practice Sheet Sec 5-3

Due tomorrow