Missing Work Block 1

1. **Report Card:** Evan, Aarav, Alex, Keely, Henry, Ruby, Lillian, Marissa, Lauren, Noah
2. **HF Anticipation Guide:** Alex
3. **HF Author's Note:** Aarav
4. **HF Chapter 1:** Henry, Lillian, Avery, Marissa, Jack, Noah
5. **HF Chapter 2:** Allison, Marissa, Ray, Noah
6. **HF Chapter 3:** Aarav, Henry, Lillian, Allison, Avery, Marissa, Ray, Noah
7. **EOC Relooping Problems:** Henry, Lillian, Avery, Alan, Marissa,

Missing Work Block 3

1. **HF Anticipation Guide:** Gabe, Rafael, Petr, Daniel, Immanuel
2. **HF Author's Note:** Rafael, Cole, Petr, Daniel, Immanuel
3. **HF Prologue:** Gabe, Rafael, Cole, Petr, Jonathan, Daniel, Immanuel
4. **HF Chapter 1:** Keion, Aboud, Gabe, Carson, Cole, Petr, Italia, Jonathan, Ryan, Daniel, Immanuel
5. **HF Chapter 2:** Keion, Aboud, Gabe, Rafael, Cole, Petr, Skyler, Jonathan, Ryan, Daniel, Immanuel, Alliyah, Kendall W.
6. **HF Chapter 3:** Keion, Aboud, Gabe, Rafael, Sydney,Cole, Petr, Skyler, Ryan, Daniel, Immanuel, Alliyah, Kendall W.
7. **EOC Relooping Problems:** Aboud, Rafael, Gabe, Cole, Danniel, Immanuel,

Missing Work Block 4

1. **HF Anticipation Guide:** Tyler C, Jackson, Carter P, Ava
2. **HF Author's Note:** Tyler C, Ian, Daniel, Carter P, Ava
3. **HF Prologue:** Tyler C, Andrew, Cole, Jackson, Carter P, Ava
4. **HF Chapter 1:** Chloe, Tyler C, Cole, Ian, Carter P
5. **HF Chapter 2:** Kirkland, Aleena, Tyler C, McKenzie, Andrew, Sophia H, Maddux, Carter P, Ava, Jacob, Steph, Tyler W
6. **HF Chapter 3:** Kirkland, Aleena, Tyler C, McKenzie, Cole, Sophia H, Carter P, Jacob, Steph, Tyler W
7. **EOC Relooping Problems:** Add names here during planning

Announcements

Absence on Friday

- Information about Friday’s plans

Unit Map

Thursday, 2/7/2019 → Transformations of functions
Friday, 2/8/2019 → Ms. Barger Absent, Hidden Figures reading and work
Monday, 2/11/2019 → Exponential Growth and Decay
Tuesday, 2/12/2019 → Compound Interest and Half Life
Wednesday, 2/13/2019 → Transformations of Exponentials
Thursday, 2/14/2019 → Scientific Notation converting back and forth
Friday, 2/15/2019 → Scientific Notation adding and subtracting & multiplying and dividing
Monday, 2/18/2019 → Scientific Notation word problems
Tuesday, 2/19/2019 → Review
Wednesday, 2/20/2019 → **Exponents Test 2**

Transforming Functions

2/7/2019


vevo

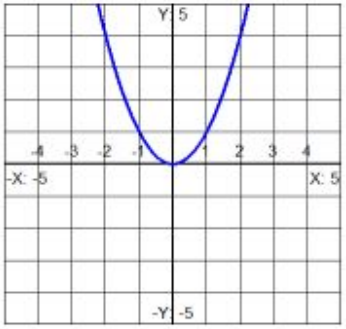
Transforming Exponential Functions

You will learn how to graph transformations of functions.

- vertical shrinking and stretching
- horizontal/ vertical shifts
- and reflecting

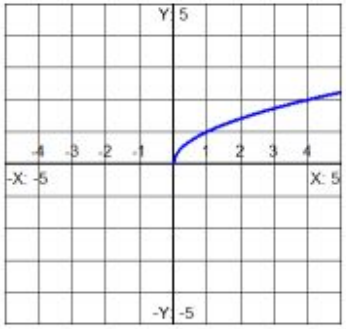
Parent Graphs

x	$y = x^2$
0	0
-1	1
1	1
-2	4
2	4



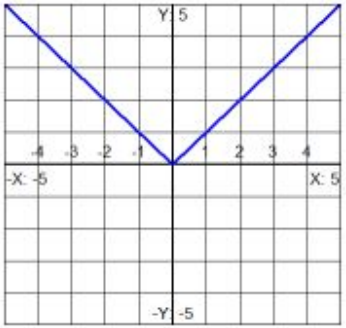
Parabola

x	$y = \sqrt{x}$
0	0
1	1
4	2



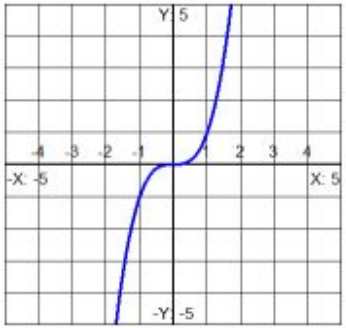
Square Root

x	$y = \lvert x \rvert$
0	0
-1	1
1	1
-2	2
2	2



Absolute Value

x	$y = x^3$
0	0
-1	-1
1	1



Cubic

Part One: Vertical Stretching and Shrinking Using Parent Graphs

Graphing functions in the form $y = a\,f(x)$. $f(x)$ could be x^2, $\sqrt{x}$, $|x|$, *or* x^3.

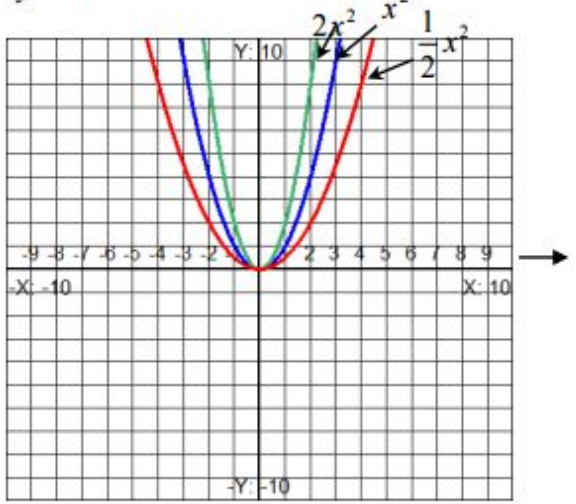
If a is a positive number greater than 1 $(a > 1) \rightarrow$ *vertical stretching*

If a is a positive number between 0 and 1 $(0 < a < 1) \rightarrow$ *vertical shrinking*

From the parent graph, multiply each y-coordinate by a to help you graph $y = a\,f(x)$.

Example 1:

a) $y = x^2$



Parabola

Parent Table

x	$y = x^2$
0	0
-1	1
1	1
-2	4
2	4

Multiplied by 2 from the y-coordinates

x	$y = 2x^2$
0	0
-1	2
1	2
-2	8
2	8

Multiplied by ½ from the y-coordinates

x	$y = \frac{1}{2}x^2$
0	0
-1	1/2
1	1/2
-2	2
2	2

$y = 2x^2$ → Multiplied parent y-coordinates by 2 (y-coordinates doubled)

$y = \frac{1}{2}x^2$ → Multiplied parent y-coordinates by $\frac{1}{2}$ (y-coordinates were divided by 2)

Part Two: Reflection About the x-axis Using Parent Graphs

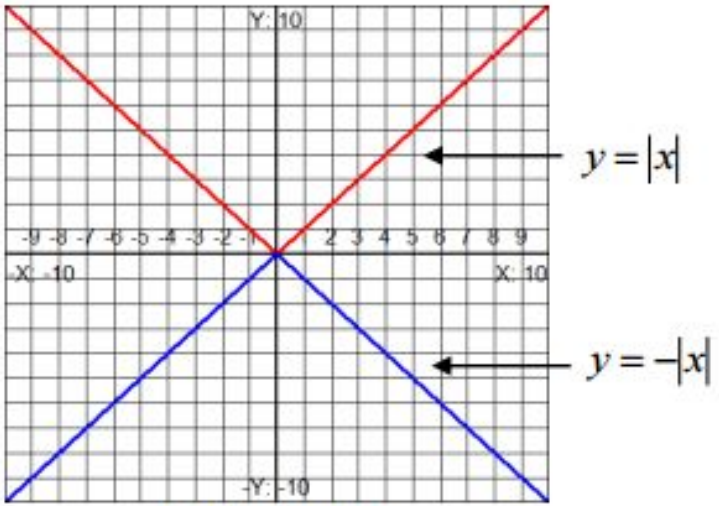
Graphing functions in the form $y = -f(x)$. $f(x)$ could be x^2, $\sqrt{x}$, $|x|$, *or* x^3.

If the function is $y = -f(x)$, then the function is reflected about the x-axis.

The negative sign in front of the function reverses the sign of every y-coordinate.

Example 2:

b) $y = -|x|$



Absolute Value

Reversed the signs of every y-coordinate

x	$y = \|x\|$
0	0
-1	1
1	1
-2	2
2	2

x	$y = -\|x\|$
0	0
-1	-1
1	-1
-2	-2
2	-2

Part Three: Horizontal Shifts Using Parent Graphs

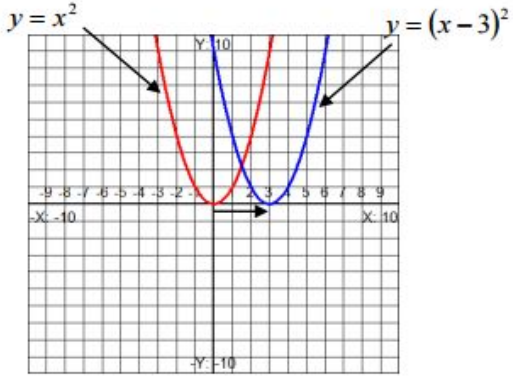
Graphing functions in the form $y = f(x+h)$. $f(x)$ could be x^2, $\sqrt{x}$, $|x|$, *or* x^3.

If the function is $y = f(x+h)$, then the function is shifted h units to the left.
Subtract h units from the x-coordinates.

If the function is $y = f(x-h)$, then the function is shifted h units to the right.
Add h units to the x-coordinates.

Example 3:

c) $y = (x-3)^2 \rightarrow$ *shifted right 3 units*

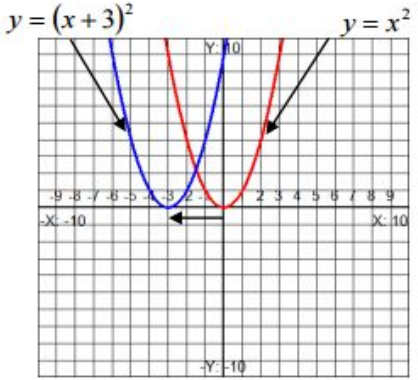


Added 3 units to the x-coordinates

x	$y = x^2$
0	0
-1	1
1	1
-2	4
2	4

x	$y = (x-3)^2$
3	0
2	1
4	1
1	4
5	4

d) $y = (x+3)^2 \rightarrow$ *shifted left 3 units*



Subtracted 3 units from the x-coordinates

x	$y = x^2$
0	0
-1	1
1	1
-2	4
2	4

x	$y = (x+3)^2$
-3	0
-4	1
-2	1
-5	4
-1	4

Part Four: Vertical Shifts Using Parent Graphs

Graphing functions in the form $y = f(x) + k$. $f(x)$ could be x^2, $\sqrt{x}$, $|x|$, *or* x^3.

If the function is $y = f(x) + k$, then the function is shifted k units up.

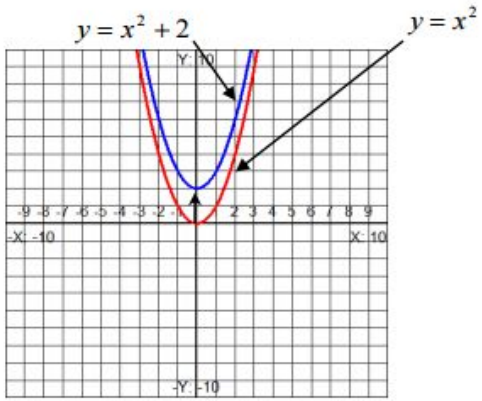
Add k units to the y-coordinates.

If the function is $y = f(x) - k$, then the function is shifted k units down.

Subtract k units from the y-coordinates.

Example 4:

e) $y = x^2 + 2 \rightarrow$ *shifted up 2 units*

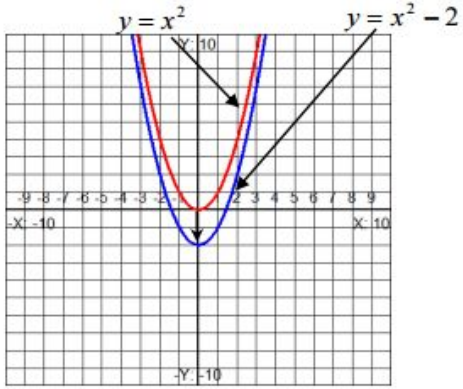


Added 2 units to the *y*-coordinates

x	$y = x^2$
0	0
-1	1
1	1
-2	4
2	4

x	$y = x^2 + 2$
0	2
-1	3
1	3
-2	6
2	6

f) $y = x^2 - 2 \rightarrow$ *shifted down 2 units*



Subtracted 2 units from the *y*-coordinates

x	$y = x^2$
0	0
-1	1
1	1
-2	4
2	4

x	$y = x^2 - 2$
0	-2
-1	-1
1	-1
-2	2
2	2

Part Five: Graphing Functions in the Form $y = -a\,f(x-h)+k$ Using the Parent Graphs

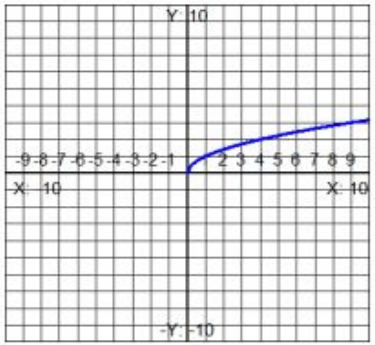
$f(x-h)$ could be $(x-h)^2$, $\sqrt{x-h}$, $|x-h|$, *or* $(x-h)^3$.

When graphing functions with several transformations, it's helpful to carry them out using the order of operations (PEMDAS). The following examples show this in five steps, since the given functions include all the transformations explained previously. First, you start with the parent graph. Second, you do the horizontal shift. Third, you do the vertical stretching/shrinking. Fourth, you do the reflection. Fifth, you do the vertical shift. If a function does not include all the transformations, simply carry out the given transformations in the order described above.

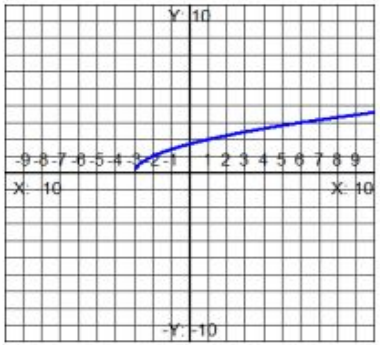
Example 5:

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

Step 1)
Parent graph $y = \sqrt{x}$

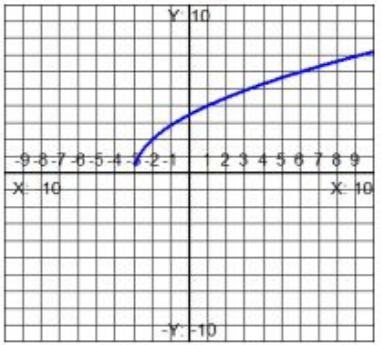


Step 2)
$y = \sqrt{x+3}$ → Shifted to the left 3 units



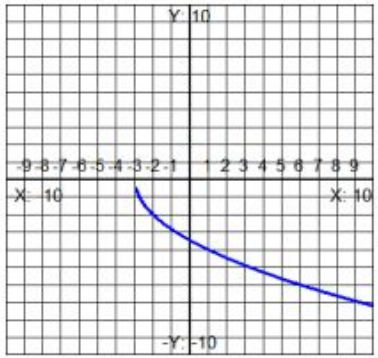
Subtracted 3 from the parent *x*-coordinates

Step 3)
$y = 2\sqrt{x+3}$ → Vertically stretched by a factor of 2



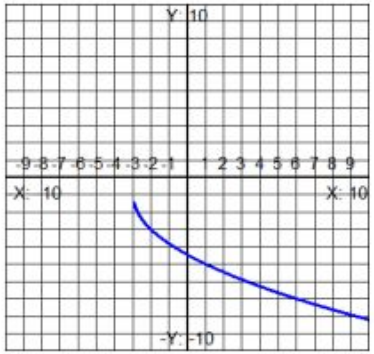
Multiplied by 2 from the *y*-coodinates
(the y-coordinates doubled)

Step 4)
$y = -2\sqrt{x+3}$ → Reflected about *the x -axis*



Reversed the signs of the *y*-coordinates

Step 5)
$y = -2\sqrt{x+3} - 1$ → Shifted down 1 unit

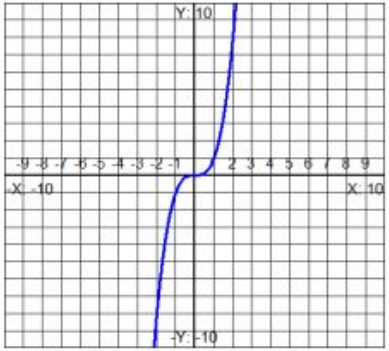


Final answer
Subtracted 1 from the *y*-coordinates

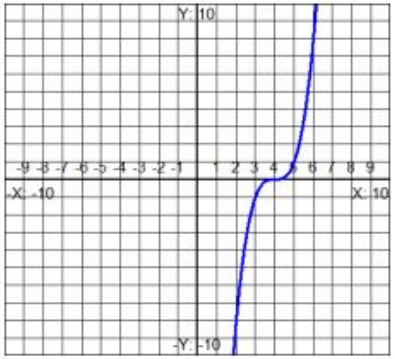
Example 6:

Graph $-\frac{1}{2}(x-4)^3+3$

Step 1)
Parent graph $y=x^3$

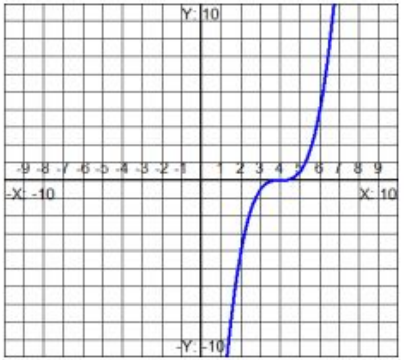


Step 2)
$y=(x-4)^3$ → Shifted to the right 4 units



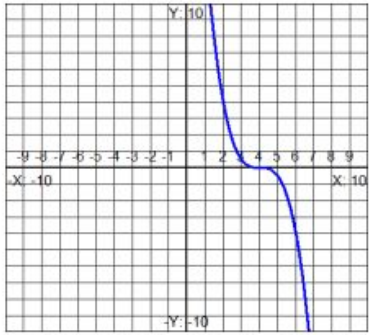
Added 4 to the parent's *x*-coordinates

Step 3)
$y=\frac{1}{2}(x-4)^3$ → Vertically shrunk by a factor of $\frac{1}{2}$



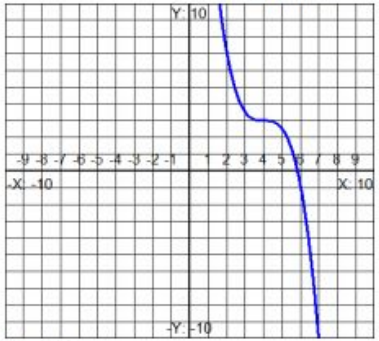
Multiplied the *y*-coodinates by $\frac{1}{2}$.
(the y-coordinates were divided by 2)

Step 4)
$y=-\frac{1}{2}(x-4)^3$ → Reflected about the *x*-axis



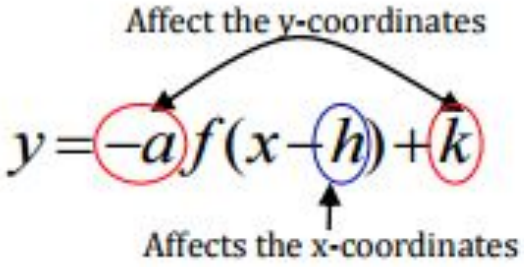
Reversed the signs of the *y*-coordinates

Step 5)
$y=-\frac{1}{2}(x-4)^3+3$ → Shifted up 3 units



Final Answer
Added 3 to the *y*-coordinates

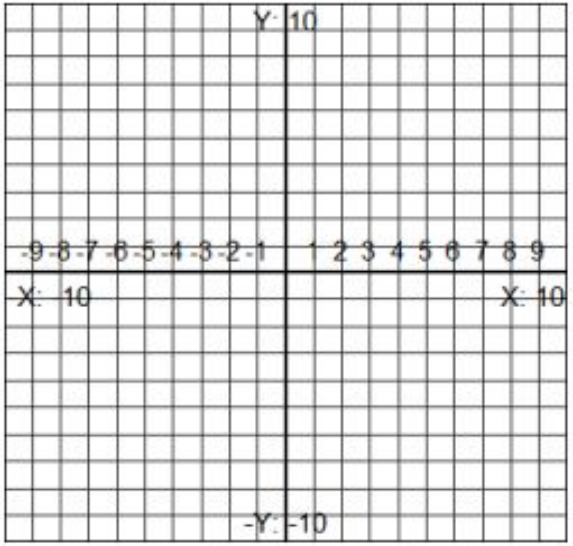
Before you move on, briefly review which transformations affect the x and y-coordinates:



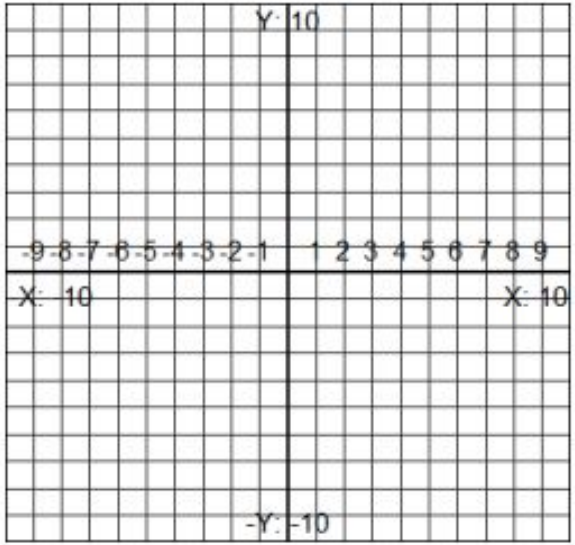
Now, that you know all the transformations performed on functions of the form $y = -a\,f(x-h)+k$ in which $f(x-h)$ could be $(x-h)^2$, $\sqrt{x-h}$, $|x-h|$, *or* $(x-h)^3$, you should be able to graph the following functions.

Try on your own

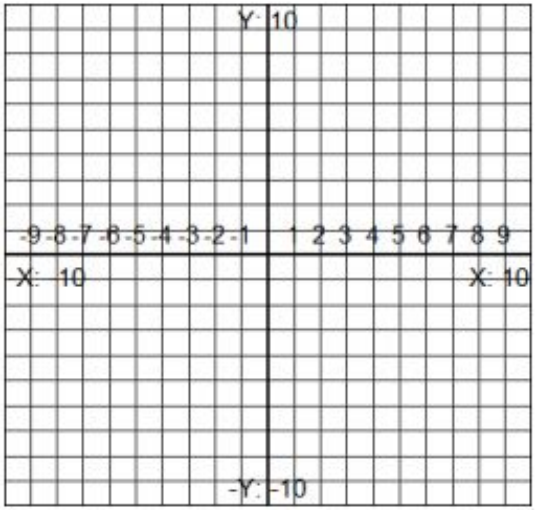
1) $y = 3(x+1)^2$



2) $y = -\frac{1}{2}\sqrt{x-5}$



3) $y = \frac{1}{2}|x+2| - 3$



Homework

Transformation of Functions Worksheet (Posted Online)