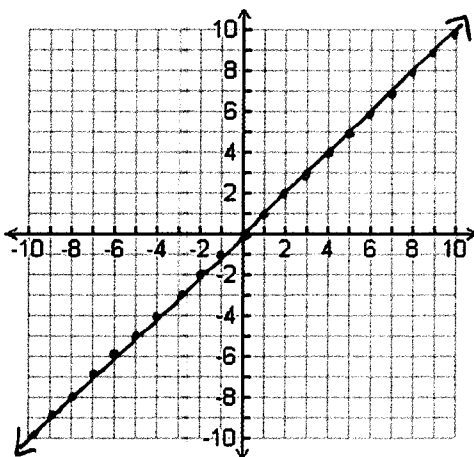# Investigating the Identity and Absolute Value Function Families

Name __Master E__

Date __/ /__   Block _____

1. Graph each parent function using a table of values.
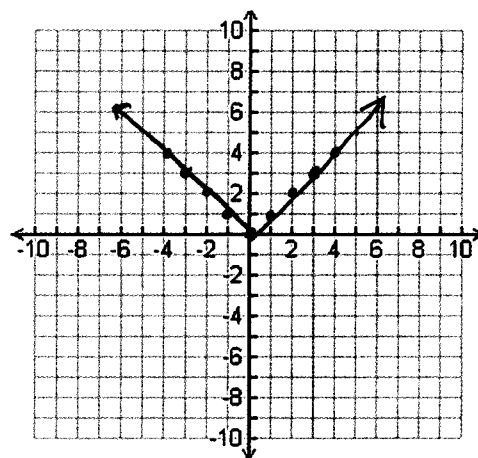
a. $f(x) = x$

x	f(x)
-4	-4
-3	-3
-2	-2
-1	-1
0	0
1	1
2	2
3	3
4	4

b. $f(x) = |x|$

x	f(x)
-4	4
-3	3
-2	2
-1	1
0	0
1	1
2	2
3	3
4	4

2. Have one person in your team access the internet and go to www.desmos.com and click on the "Launch Calculator" button.

3. Graph $y = x$ and $y = |x|$. Type one of the functions in the column on the left side of the screen. Then click the **+** button to add another f(x) "expression". The graphs will both appear on the grid.

a. How are these functions related? (Compare the coordinates of the points.)

The first quadrant has the same points!

3. Delete y = x from the left column and and add the function $y = |x - 3|$ to the list of functions.

a. Compare the new function $y = |x - 3|$ with parent function $y = |x|$. How is the graph of the new function different from the graph of the parent function?

It shifted to the right by 3 units

b. What do you think caused this change in the graph of the new function?

The minus 3

c. Can you predict how the graph of $y = |x + 3|$ will be different from the parent function $y = |x|$?

Shifts to the left by 3

4. If $y = |x - h|$, write a rule explaining how 'h' affects the parent graph of $y = |x|$.

It causes the graph to shift left and right by h units

5. Predict what should happen to the graphs of $y = |x| + 4$ and $y = |x| - 4$ as compared to $y = |x|$.

See #6 & 7

6. Graph $y = |x| + 4$ in Desmos. Graph $y = |x| - 4$. Describe what happened as compared to $y = |x|$.
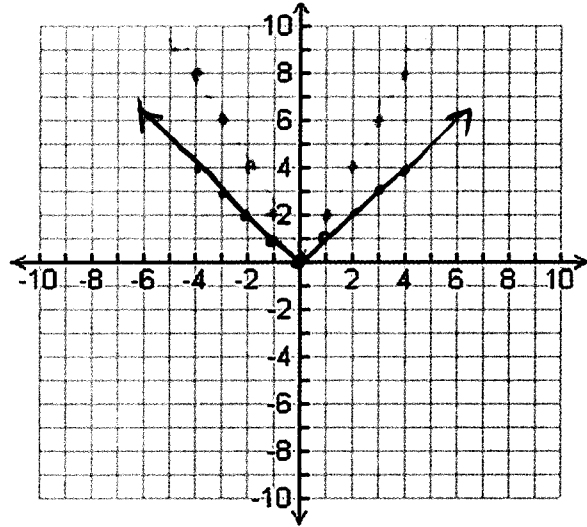
shifts the graph up 4   → shifts it down 4

7. If $y = |x| + k$, write a rule explaining how 'k' affects the parent graph of $y = |x|$.

It causes the graph to shift up and down.

8. Graph y = |x| and y = 2|x| by hand and compare the graphs. Fill in the table of values below, and draw both graphs on the same set of axes using different colors.

f(x) = |x|	
x	f(x)
-4	4
-3	3
-2	2
-1	1
0	0
1	1
2	2
3	3
4	4

f(x) =2|x|	

9. Compare the graph and the table of values for f(x) = 2|x| with the graph of the parent function f(x) = |x|. How is the graph of the f(x) = 2|x| different from the graph of the parent function?

The graph stretches up vertically and the slope is 2 instead of 1

10. Graph y = |x| and y = $\frac{1}{2}$|x| in Desmos and compare the two functions. How is the graph of

y = $\frac{1}{2}$|x| different from the graph of the parent function? (You can view the table of values in

Desmos by clicking on the ⚙ button and changing to the table view ▦ .)

The graph compresses vertically towards the x-axis.

11. Predict what should happen to the graph of each function below as compared to y = |x|.

a. y = 3|x|

stretches vertically by 3

b. y = $\frac{1}{2}$ |x|

compresses vertically

c. y = -|x|

reflects over the x-axis

12. Now test your predictions. Were your predictions correct?

Graph them is Desmos

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13. If y = a|x| , write rule(s) explaining how 'a' affects the parent graph of y = |x|.

a causes the graph to stretch or compress vertically or reflect over the x-axis (turn upside down).

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14. Now that you have explored the three parameters 'a', 'h', and 'k' separately, describe all of the ways that the graph of y = 2|x − 4| − 7 will be changed as compared to the graph of the parent function y = |x|.

rate

Stretch vertically w/ a slope of 2, shift right 4 and down 7.

stretches by a factor of 2