

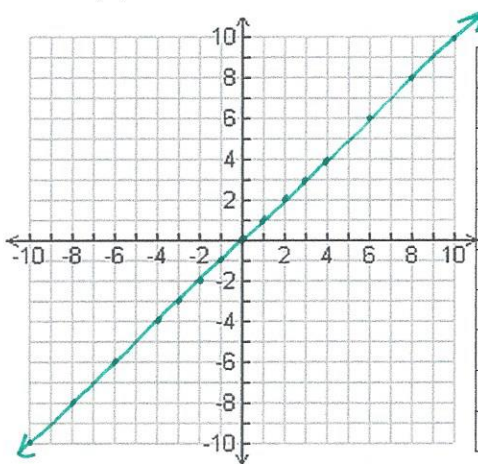
Investigating the Identity and Absolute Value Function Families

Name Keyz
Date _____ Block _____

1. Graph each parent function using a table of values.

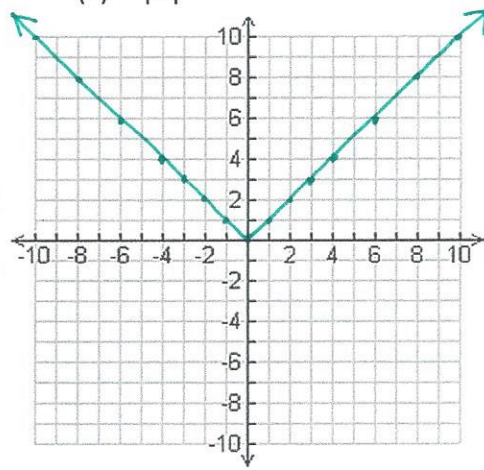
a. $f(x) = x$

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. 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 negative output (y) values for $y = x$ are positive for $y = |x|$ which causes the line to become a V shape.

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

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

The new function shifts right 3 units.

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

The -3 inside the absolute value.

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

It should shift left 3 units.

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

h causes the graph to shift left or right in the direction opposite of the sign.

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

reword.

6. Graph $y = |x| + 4$ in Desmos. Graph $y = |x| - 4$. Describe what happened as compared to $y = |x|$.

+4 caused the graph to shift up 4 units; -4 went down 4 units.

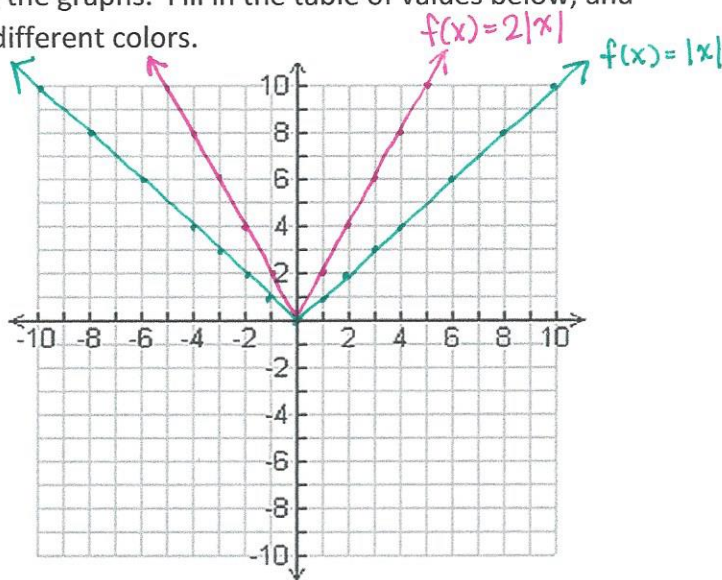
7. If $y = |x| + k$, write a rule explaining how 'k' affects the parent graph of $y = |x|$.

k causes the graph to shift up or down in the direction of the sign.

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 $	
x	f(x)
-4	8
-3	6
-2	4
-1	2
0	0
1	2
2	4
3	6
4	8



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 of $y = 2|x|$ is more narrow than $y = |x|$. The y-values have been stretched by a factor of 2.

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 of $y = \frac{1}{2}|x|$ is wider than $y = |x|$. The y-values have been compressed by a factor of $\frac{1}{2}$.

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

a. $y = 3|x|$

stretch by a factor of 3 (more narrow)

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

see #10

c. $y = -|x|$

reflected across the x-axis.

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

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

- $a < 0$ causes the graph to reflect (open downward) across the x-axis
- $0 < a < 1$ causes a vertical compression; $a > 1$ causes a vertical stretch (wider graph) (more narrow graph)

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 $y = |x|$.

The graph will be translated 4 units to the right and 7 units down. It will open upward and be stretched by a factor of 2.