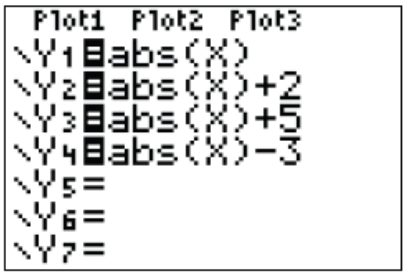
Name_____ Hour_____ **Activity 2.7 -- Exploring Transformations**

You can investigate families of *absolute value functions* with equations of the form $y = a|x - h| + k$ by varying the values of *a, h,* and *k* and then graphing. The resulting graphs are *transformations* of the graph of the parent function $y = |x|$.
**For each Exploration, graph and view each equation one at a time so that you can see how changes in the equation affect the graph.

Exploration 1 -- *Investigate the graph of* $y = |x| + k$.

This is how they look on the calculator:



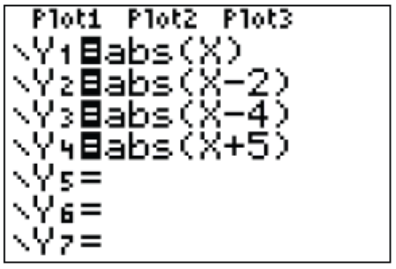
One at a time, enter the following equations.
y = |x| y = |x| + 2 y = |x| + 5 y = |x| - 3

Press Zoom 6 to view the graph in a standard window.

Q 1. Describe how the family of graphs of $y = |x| + k$ is related to the graph of y = |x| . Be specific!

Exploration 2 -- *Investigate the graph of* $y = |x - h|$.

This is how they look on the calculator:



Clear out all your old graphs.
Then, one at a time, enter the following equations.

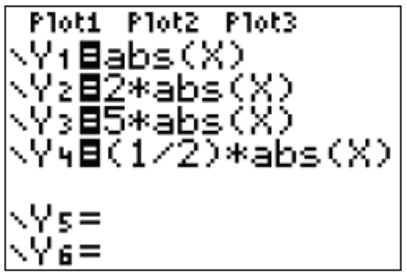
y = |x| y = |x − 2| y = |x − 4| y = |x + 5|

Press Zoom 6 to view the graph in a standard window.

Q 2. Describe how the family of graphs of $y = |x - h|$ is related to the graph of y = |x| . Be specific!

Exploration 3 -- *Investigate the graph of* $y = a|x|$ where a > 0.

This is how they look on the calculator:



Clear out all your old graphs.
Then, one at a time, enter the following equations.

y = |x| y = 2 |x| y = 5 |x| y = $\frac{1}{2}$ |x|

Press Zoom 6 to view the graph in a standard window.

Q 3. Describe how the family of graphs of $y = a|x|$ where a > 0, is related to the graph of y = |x| . Be specific!

Exploration 4 -- ***Investigate the graph of*** $y = a|x|$ **where a < 0.**

Clear out all your old graphs.
Then, one at a time, enter the following equations.

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

Press Zoom 6 to view the graph in a standard window.

Q 3. Describe how the family of graphs of $y = a|x|$ where a < 0,
is related to the graph of $y = |x|$. Be specific!

Summarize: Consider the graph of $y = a|x - h| + k$. Be specific with your answers.

Q 4: How does the value of *k* affect the graph?

Q 5: How does the value of *h* affect the graph?

Q 6: How does the "size" of *a* affect the graph? (i.e. what happens if *a* is larger or smaller?)

Q 7: How does the sign (positive/negative) of *a* affect the graph?

Apply: Describe how the graph of the given equation is related to the graph of $y = |x|$**. Be specific. Then graph the given equation along with** $y = |x|$ **to confirm your answer.**

8. $y = |x| + 6$
9. $y = |x| - 4$
10. $y = |x - 3|$
11. $y = |x + 2|$
12. $y = \frac{2}{3}|x|$
13. $y = -6|x|$
14. $y = |x - 1| + 2$
15. $y = 3|x + 2|$
16. $y = -0.5|x + 1| + 7$