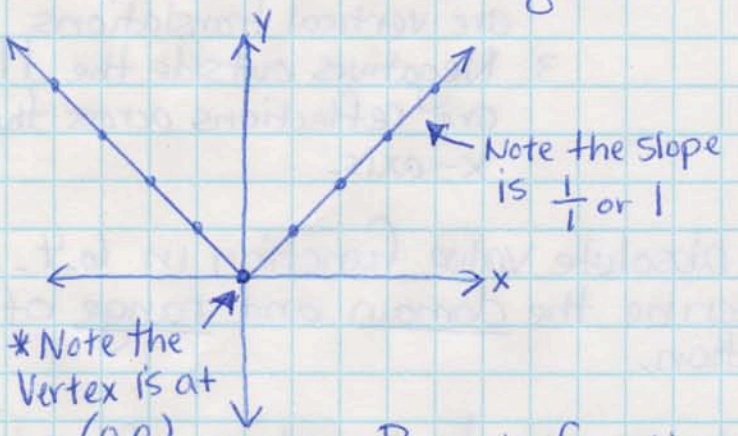
6.4 Absolute Value Functions

We worked a little with absolute value in Unit 2, but we never learned to solve inequalities with absolute value, so here we go.

* Remember the definition of absolute value is the distance a number is from zero on the number line.

The absolute value function $y=|x|$ is called a parent function because it is the most basic absolute value equation. It looks like this when graphed:



When the parent function $y=|x|$ is changed in some way that is called a transformation.

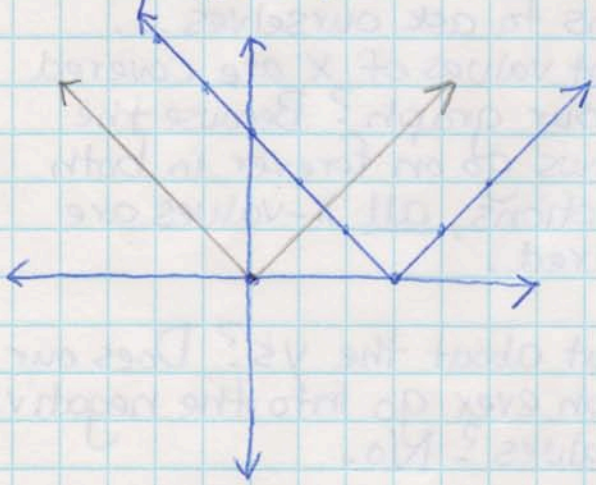
Parent functions can be moved horizontally, vertically or reflected.

Here's an example:

$y=|x-3|$

Make a table

X	Y
-2	5
-1	4
0	3
1	2
2	1
3	0
4	1
5	2



Look at the vertex. What happened to the parent function?

* The graph shifted 3 units to the right. *

$y=|-2-3|=5$
$y=|-1-3|=4$
$y=|0-3|=3$
$y=|1-3|=2$

$y=|2-3|=1$
$y=|3-3|=0$
$y=|4-3|=1$
$y=|5-3|=2$

Let's use our graphing program, Grapher, to find the transformations of the following:

1. $y = |x+3|$
2. $y = |x| + 4$
3. $y = -|x-2|$
4. $y = |x+1| - 3$
5. $y = -|x-5| + 1$

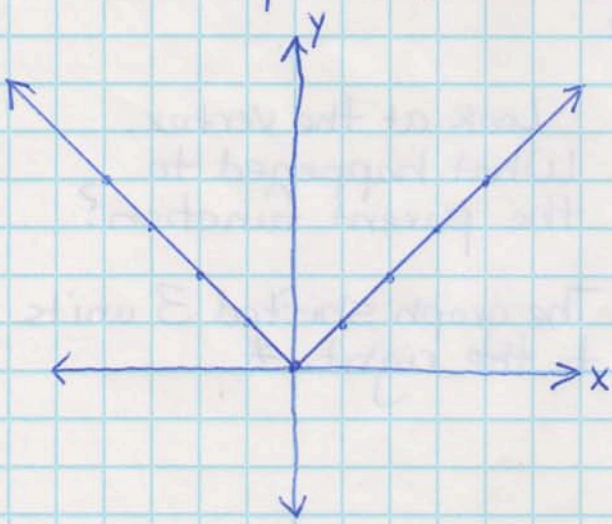
Can you make any associations with where the number is in the parent function and the type of transformation?

You should notice that:
1. Numbers in the | | are a horizontal translation.
2. Numbers outside the | | are vertical translations
3. Negatives outside the | | are reflections across the x-axis.

One last thing about the absolute value function in 6.4... You must be able to describe the <u>domain</u> and <u>range</u> of an absolute value function.

Remember that <u>domain</u> equates to <u>x-values</u> of a relation. The <u>range</u> equates to the <u>y-values</u>.

How does this apply to absolute value? Let's look at our parent function again.



Questions to ask ourselves...
1. What values of x are covered by our graph? Because the arrows go on forever in both directions, <u>all</u> x-values are covered.
2. What about the ys? Does our graph ever go into the negative y-values? No.

Therefore, the domain is <u>all real numbers</u>. The range is $y \geq 0$.

H.W. Pg 298 (36-47)
Also describe the transformation.
You may use <u>Grapher</u>