## Algebra 2

## Lesson 1-5: Absolute Value Equations and Inequalities Mrs. Snow, Instructor

When you travel to school you travel a certain distance, like 5.2 miles. The distance from school to home would then be 5.2 miles as well, NOT -5.2 miles. Distance is an absolute value. In equations absolute value of a number is its distance from zero on the number line and uses the symbol . Remember absolute value is nonnegative!

Therefore, if $x \geq 0$ (positive), then $|x|=x$ and $|-x|=x$.
For example: $|-16|=16$,

$$
|53|=53
$$

To solve equations with absolute values remember the following steps and rules.

1. Absolute value equations will have two (2) solutions.
2. To solve and absolute value equation first isolate the absolute value expression on the left side of the equation.
3. Break down the equation into 2 separate equations using an "or" between them.
4. The right sides of the equations will opposites.
5. Caution you may solve and get an extraneous solution which is not really a solution, it is a false solution that is wrong! Extraneous solutions are found when checking the answers. So, CHECK YOUR WORK!!
6. Absolute value equations may not have a solution; remember absolute values cannot be equal to a negative value.
7. Absolute value inequalities are handled similarly to equalities. The right sides of the equations will be opposites with the inequality symbol will be opposite too.
8. Definition: Therefore, if $x \geq 0$, then $|x|=x$ if $x=5$, then $|5|=5$

$$
x<0, \text { then }|x|=-x \text { if } x=-6, \text { then }|-6|=6=-(-6)
$$

## Examples:

| $2\|3 x-1\|=8$ | $\frac{1}{4}\|3 t-2\|-10=15$ |
| :---: | :---: |
| $\|2 x+5\|=3 x+4$ | $\|4 w+9\|=-7$ |
| $\|3 x+6\| \geq 12$ <br> $3 x+6 \geq 12$ <br> or $3 x+6 \leq-12$ | $\|3 x-2\|+4 \leq 7$ |

