

2.6-2.7 Quiz

Friday (9/28)

## Solving Absolute Value Equations & Inequalities

Absolute Value: Taking the **POSITIVE** value of a number.

ex)  $|x| = 5$

$x$  can be 5 or -5

1<sup>st</sup> Equation: Same as original w/o | |.

2<sup>nd</sup> Equation: Change the # after the = to opposite.

ex)  $|x - 4| = 6$

means:

Equation #1) 
$$\begin{array}{r} x - 4 = 6 \\ +4 \quad +4 \\ \hline x = 10 \end{array}$$

OR Equation #2) 
$$\begin{array}{r} x - 4 = -6 \\ +4 \quad +4 \\ \hline x = -2 \end{array}$$

\*EQUAL sign uses "or"

\*\*you need 2 equations... Always !!

The first equation as is, the second equation put the opposite after the =.

\*\* For every type of absolute value equation, once you make the 2 equations, you must get rid of the absolute value bars.

→ And case

Ex)  $|3 + 2x| < 11$

means...

1) Same as the original w/o | |.

2) Flip the sign & change # to opposite.

Always the same as inside  
the | |.  
$$\begin{array}{r} 3 + 2x < 11 \\ -3 \quad -3 \\ \hline 2x < 8 \\ x < 4 \end{array}$$

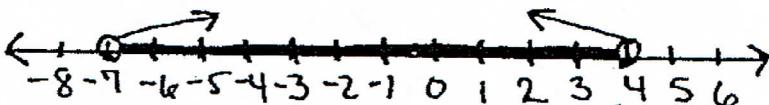
AND

$|3 + 2x| > -11$

$$\begin{array}{r} 3 + 2x > -11 \\ -3 \quad -3 \\ \hline 2x > -14 \\ x > -7 \end{array}$$

\*Flip the sign & take the opposite

\* Less Than "AND"



Set Notation:  $\{x \mid -7 < x < 4\}$

Ex)  $|3x + 4| \leq 8$  1) Same as original w/o | |.

1)  $3x + 4 \leq 8$  And 2)  $3x + 4 \geq -8$

Flip the sign & change # to opposite.

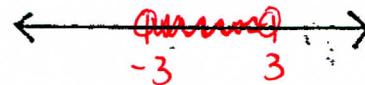
Ex)  $|x| < 3$

1)  $x < 3$  and 2)  $x > -3$

$$\begin{array}{r} 3x \leq 4 \\ \frac{3x}{3} \leq \frac{4}{3} \\ x \leq \frac{4}{3} \end{array}$$
 And 
$$\begin{array}{r} 3x \geq -12 \\ \frac{3x}{3} \geq \frac{-12}{3} \\ x \geq -4 \end{array}$$



Set Notation:  $\{x \mid -4 \leq x \leq \frac{4}{3}\}$



Set Notation:  $\{x \mid -3 < x < 3\}$

1) Same as Original w/o  $| \quad |$ .

2) Flip the sign & change # to opposite.

Ex)  $|6y - 12| \geq 36$  means...

$$1) 6y - 12 \geq 36 \text{ OR } 6y - 12 \leq -36$$
$$\begin{array}{rcl} +12 & +12 & \\ \hline & & \end{array}$$

$$\frac{6y \geq 48}{6}$$

$$\frac{6y \leq -24}{6}$$

$$y \geq 8 \text{ OR }$$

$$y \leq -4$$



Set Notation:

$$\{x | y \leq -4 \text{ or } y \geq 8\}$$

\*Flip the sign & take the opposite

\*Greater "OR"

ex)  $|5 + 2x| > 3$

$$5 + 2x > 3 \text{ OR } 5 + 2x < -3$$
$$\begin{array}{rcl} -5 & -5 & \\ \hline & & \end{array}$$

$$\frac{2x > -2}{2} \quad \frac{2x < -8}{2}$$
$$\begin{array}{rcl} x > -1 & \text{OR} & x < -4 \\ \leftarrow \begin{matrix} -1 \\ -4 \end{matrix} & & \begin{matrix} -4 \\ -1 \end{matrix} \rightarrow \end{array}$$

Set Notation:  $\{x | x < -4 \text{ or } x > -1\}$

ex)  $|x - 9| > 0$

$$x - 9 > 0 \text{ OR } x - 9 < 0$$
$$\begin{array}{rcl} x > 9 & & x < 9 \\ \leftarrow \begin{matrix} 9 \\ 9 \end{matrix} \rightarrow & & \begin{matrix} 9 \\ 9 \end{matrix} \rightarrow \end{array}$$

$\{x | x \neq 9\}$   
Set Notation

ex)  $|x + 3| + 1 > 10$

\*you must get rid  
of the 1 first. Then  
you have your 2 equations

$$\begin{array}{rcl} -1 & -1 & \\ \hline & & \end{array}$$

$$|x + 3| > 9$$

$$\begin{array}{rcl} x + 3 > 9 & \text{OR} & x + 3 < -9 \\ -3 & -3 & \\ \hline & & \end{array}$$

$$\begin{array}{rcl} x > 6 & \text{OR} & x < -12 \\ \leftarrow \begin{matrix} 6 \\ -12 \end{matrix} & & \begin{matrix} -12 \\ 6 \end{matrix} \rightarrow \end{array}$$

Set Notation:  $\{x | x < -12 \text{ or } x > 6\}$

ex)  $|5x - 3| \leq 12$

$$5x - 3 \leq 12 \text{ And } 5x - 3 \geq -12$$

$$5x \leq 15$$

$$x \leq 3$$

$$5x \geq -9$$

$$x \geq -\frac{9}{5}$$

$$\leftarrow \begin{matrix} -9/5 \\ 3 \end{matrix} \rightarrow \quad \{x | -\frac{9}{5} \leq x \leq 3\}$$

ex)  $|3x - 7| \geq 2$

$$3x - 7 \geq 2 \text{ OR } 3x - 7 \leq -2$$
$$\begin{array}{rcl} +7 & +7 & \\ \hline & & \end{array}$$

$$\frac{3x \geq 9}{3} \quad \frac{3x \leq 5}{3}$$

$$x \geq 3 \text{ OR } x \leq \frac{5}{3}$$

$$\leftarrow \begin{matrix} 5/3 \\ 3 \end{matrix} \rightarrow$$

Set Notation:  $\{x | x \leq \frac{5}{3} \text{ or } x \geq 3\}$

ex)  $|x - 9| > 0$

$x - 9 < 0$  And  $x - 9 > 0$

$x < 9$  and  $x > 9$

$$\leftarrow \begin{matrix} 9 \\ 9 \end{matrix} \rightarrow$$

No Solution.  $\{\emptyset\}$

ex)  $|4x + 1| - 3 \leq 7$  Empty Set.

$$\begin{array}{rcl} +3 & +3 & \\ \hline & & \end{array}$$

$$\frac{2|4x + 1| \leq 10}{2} \Rightarrow |4x + 1| \leq 5$$

$$4x + 1 \leq 5 \text{ And } 4x + 1 \geq -5$$
$$\begin{array}{rcl} -1 & -1 & \\ \hline & & \end{array}$$

$$\frac{4x \leq 4}{4} \quad \frac{4x \geq -6}{4}$$
$$\leftarrow \begin{matrix} 1 \\ -3/2 \end{matrix} \quad \begin{matrix} 1 \\ 1 \end{matrix} \rightarrow \quad x \geq -\frac{3}{2}$$

Set Notation:  $\{x | -\frac{3}{2} \leq x \leq 1\}$

ex)  $|3x + 3| \geq 6$

$$3x + 3 \geq 6 \text{ OR } 3x + 3 \leq -6$$

$$3x \geq 3$$

$$x \geq 1$$

$$3x \leq -9$$

$$x \leq -3$$

$$\leftarrow \begin{matrix} -3 \\ 1 \end{matrix} \rightarrow \quad \{x | x \leq -3 \text{ or } x \geq 1\}$$