# NOTES: ABSOLUTE VALUE EQUATIONS

**DAY 6**

(with extraneous solutions)

Textbook Chapter 1.7

**OBJECTIVE**: Today you will learn about extraneous solutions AND how to solve absolute value inequalities!

1. $|3x + 1| - 5 = -3$

$+5 \quad +5$

$|3x+1| = 2$

$3x+1 = 2$ or $3x+1 = -2$

$-1 \quad -1$ $\quad$ $-1 \quad -1$

$3x = 1$ $\quad$ $3x = -3$

$\frac{3x}{3} = \frac{1}{3}$ $\quad$ $\frac{3x}{3} = \frac{-3}{3}$

$x = 1/3$ $\quad$ $x = -1$

$\boxed{x = 1/3, -1}$

2. $|2x + 12| = 4x$

$2x+12 = 4x$ or $2x+12 = -4x$

$-2x \quad -2x$ $\quad$ $-2x \quad -2x$

$\frac{12}{2} = \frac{2x}{2}$ $\quad$ $\frac{12}{-6} = \frac{-6x}{-6}$

$6 = x$ $\quad$ $-2 = x$ ext.

Check: $|2(6)+12| \stackrel{?}{=} 4(6)$ $\quad$ $|2(-2)+12| \stackrel{?}{=} 4(-2)$

$|24| = 24$ ✓ $\quad$ $|8| \neq -8$

$\boxed{x = 6}$

3. $|x + 3| = 8$

$x+3 = 8$ or $x+3 = -8$

$-3 \quad -3$ $\quad$ $-3 \quad -3$

$x = 5$ $\quad$ $x = -11$

$\boxed{x = 5, -11}$

4. $-2\,|x + 7| = -14$

$\frac{-2}{-2} \quad \frac{-14}{-2}$

$|x+7| = 7$

$x+7 = 7$ or $x+7 = -7$

$-7 \quad -7$ $\quad$ $-7 \quad -7$

$x = 0$ $\quad$ $x = -14$

$\boxed{x = 0, 14}$

5. Interpret $|2x + 3| = -7$

A number times 2 plus 3 is -7 units away from 0.

↑ hmmm...

Between

# NOTES: ABSOLUTE VALUE INEQUALITIES (AND)

Textbook Chapter 1.7

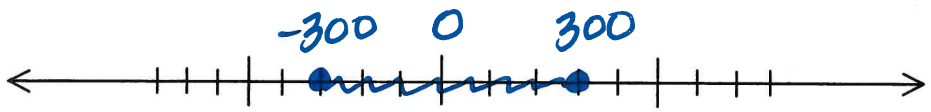
**Example 1**: $|x| \leq 3$

a. What values will satisfy the inequality?

b. Graph.


c. Write a **COMPOUND** inequality that is equivalent to $|x| \leq 3$: $-3 \leq x \leq 3$

**Example 2**: My credit card balance ranges from –$300 to $300 at any given time.




a. Write this situation as a **COMPOUND** inequality: $-300 \leq x \leq 300$

b. How can you write this inequality as an absolute value? $|x| \leq 300$

**Example 3**: $|x + 1| \leq 3$

$$-3 \leq x+1 \leq 3$$
$$-1 \quad -1 \quad -1$$
$$-4 \leq x \leq 2$$


**Example 4**: $|2x + 4| \leq 12$

$$-12 \leq 2x+4 \leq 12$$
$$-4 \quad -4 \quad -4$$
$$\frac{-16}{2} \leq \frac{2x}{2} \leq \frac{8}{2}$$
$$-8 \leq x \leq 4$$

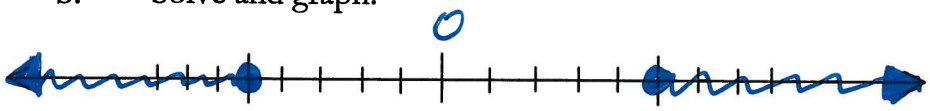
# NOTES: ABSOLUTE VALUE INEQUALITIES (OR) DAY 6

Textbook Chapter 1.7

**Example 4**: $|x| \geq 5$

a. What values will satisfy the inequality?

b. Solve and graph.

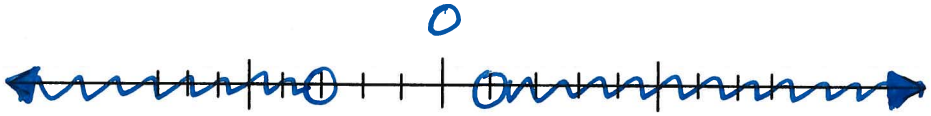



c. Write a **DISJOINT** inequality that is equivalent to $|x| \geq 5$: _____

**Example 5**: $|x + 1| > 2$

$x+1 > 2$ $\quad -1 \quad -1$ $\quad x > 1$

$x+1 < -2$ $\quad -1 \quad -1$ $\quad x < -3$



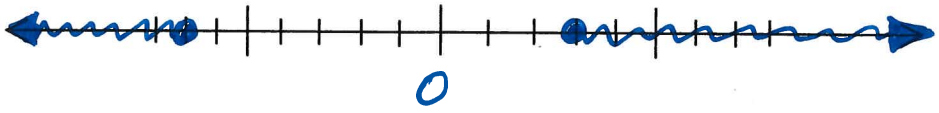

**Example 6**: $|2x + 4| + 2 \geq 12$

$-2 \quad -2$

$|2x+4| \geq 10$

$2x+4 \geq 10$ $\quad -4 \quad -4$ $\quad \frac{2x}{2} \geq \frac{6}{2}$ $\quad x \geq 3$

$2x+4 \leq -10$ $\quad -4 \quad -4$ $\quad \frac{2x}{2} \leq \frac{-14}{2}$ $\quad x \leq -7$




**COMPARE** (in as many ways as possible): $|x| < 3$ and $|x| \geq 3$

# PRACTICE: ABSOLUTE VALUE EQUATIONS AND INEQUALITIES

Solve and graph.

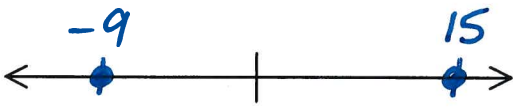
1. $|x - 3| = 12$

$x - 3 = 12$ $\quad +3 \quad +3$

$x = 15$

$x - 3 = -12$ $\quad +3 \quad +3$

$x = -9$




2. $2|y + 7| + 13 = 15$

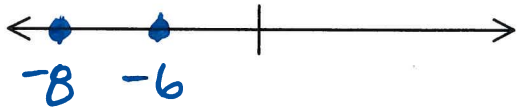
$-13 \quad -13$

$\frac{2|y+7|}{2} = \frac{2}{2}$

$|y + 7| = 1$

$y + 7 = 1$ $\quad$ $y + 7 = -1$

$y = -6$ $\quad$ $y = -8$




3. $|5x + 2| \leq 3$

$-3 \leq 5x + 2 \leq 3$

$-2 \quad -2 \quad -2$

$\frac{-5}{5} \leq \frac{5x}{5} \leq \frac{1}{5}$

$-1 \leq x \leq 1/5$


4. $|3y + 4| > 8$

$3y + 4 > 8$ $\quad -4 \quad -4$

$\frac{3y}{3} > \frac{4}{3}$

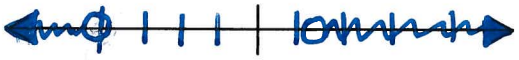
$y > 4/3$

$y > 1\frac{1}{3}$

$3y + 4 < -8$ $\quad -4 \quad -4$

$\frac{3y}{3} < \frac{-12}{3}$

$y < -4$



5. $2|m + 5| + 10 \leq 16$

$-10 \quad -10$

$\frac{2|m+5|}{2} \leq \frac{6}{2}$

$|m + 5| \leq 3$

$-3 \leq m + 5 \leq 3$

$-5 \quad -5 \quad -5$

$-8 \leq m \leq -2$


6. $\left|\frac{x}{5} + 3\right| > 2$

$\frac{x}{5} + 3 > 2$

$-3 \quad -3$

$5\left(\frac{x}{5}\right) > (-1)5$

$x > -5$

$\frac{x}{5} + 3 < -2$

$-3 \quad -3$

$5\left(\frac{x}{5}\right) < -5 \cdot 5$

$x < -25$