Section 2.8: Absolute Value

Definition: The **absolute value** of *x*, denoted |*x*|, is the distance *x* s from 0.

Solving Absolute Value Equations

- If $|x| = 0$ then $x = 0$.
- If C is positive, then $|x| = C$ if and only if $x = \pm C$.
- If C is negative, then $|x| = C$ has no solution.

Example 1: Solve.

a. $|2x - 3| = 7$

b. $|6 - 2x| + 6 = 14$

c. $-2|2x - 8| + 4 = 30$

d. $-4\left|\frac{1}{2}x + 1\right| + 3 = 11$

Next, we'll look at inequalities. The approach to these problems will depend on whether the problem is a "less than" problem or a "greater than" problem. If C is zero, then $x = 0$.

Solving Absolute Value Inequalities

- If C is positive, then $|x| < C$ if and only if $x < C$ AND $x > -C$. (This is also true if you use $\leq$.)
- If C is positive, then $|x| > C$ if and only if $x > C$ OR $x < -C$. (This is also true if you use $\geq$.)

Example 2: Solve the inequality. Graph the solution on the real number line. Write the solution using interval notation:

a. $|x + 3| \leq 8$

b. $2\left|\frac{-x+3}{4}\right| > 6$

c. $3|1-4x|+1<25$

Special Case:
If C is negative, then:
a) The inequalities $|x|<C$ and $|x|\leq C$ have no solution.
b) Every real number satisfies the inequalities $|x|>C$ and $|x|\geq C$

Example 3: Solve each inequality and write the solution in interval notation.

a. $3|3x-10|+7>1$

b. $-2|x+2|-10>4$