Solving Absolute Value Equations

By the end of this lesson you will be able to:

Solve absolute value equations analytically.
GPS MM2A1c

Review of absolute value

- Absolute value is defined as the distance from zero. (Can distance be negative??)

For example:

$$|-3| = 3 = |3|$$

$$|-y| = y = |y|$$

$$|-5r| = 5r = |5r|$$

What would be the answer to the following:

$$|-14| = ?$$

$$|-8x| = ?$$

Solving Absolute Value Equations

- In order to solve absolute value equations, we must remember that $|x| = x$ and $|-x| = x$

So when we solve absolute value equations we need to split the equation up into a positive and negative expression. For example:

Find the positive solution.

$$|x + 2| = 6$$

Find the negative solution

Absolute value part of the equation needs to be by itself!!

$$x + 2 = 6$$

$$x = 4$$

$$x + 2 = -6$$

$$x = -8$$

Solving Absolute Value Equations

What about solving this one? $|x - 1| + 2 = 5$

Much like solving quadratic equations, we need to isolate the variable part from the constants.

$$|x - 1| + 2 = 5$$
$$\underline{ -2 \quad -2}$$
$$|x - 1| = 3$$

$$x - 1 = 3 \qquad x - 1 = -3$$

$$x = 4 \qquad\qquad x = -2$$

Isolate the abs value!

$$2|x + 7| - 6 = 12$$

$$2|x + 7| = 18$$

$$|x + 7| = 9$$

Now you can split into two equations!

$$x + 7 = 9$$

$$x = 2$$

$$x + 7 = -9$$

$$x = -16$$

Solving Absolute Value Equations with Variables on Both Sides

$$|4x-8| = x+2$$

$$4x-8 = x+2$$

$$3x = 10$$

$$x = \frac{10}{3}$$

$$4x-8 = -(x+2)$$

$$4x-8 = -x-2$$

$$5x = 6$$

$$x = \frac{6}{5}$$

Decide whether the number is a solution to the equation.

$$|2x - 5| = 9; -2$$

So we take -2 and plug it in for x.

$$|2(-2) - 5| = 9$$

$$|-4 - 5| = 9$$

$$|-9| = 9$$

$$9 = 9 \checkmark$$

Decide whether the number is a solution to the equation.

$$\left|5x+1\right|-11=0; 4$$

No; the two solutions are x=2 and x=-12/5

Practice Problems:

$$|2x - 1| = 7$$

$$|5 - x| = 5$$

$$-3, 4$$

$$0, 10$$

$$|5x - 3| = 8$$

$$3|(x - 2)| - 2 = 10$$

$$-1, \frac{11}{5}$$

$$6, -2$$

Classwork/Homework

- P. 30 (1-15) and p. 31 (1-9)