Once and For All...Absolutely

An Exploration into Solving Absolute Value Inequalities

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October 1, 2007

Open the lesson Algebra_AbsoluteValue_Trogdon.tns

Below are questions/notes about the problems in the TI-Nspire lesson activity. Your responses will provide a record of the concepts you encountered while doing the calculator activity.

Problem 1:

1. There are two solutions to the equation $|x| = N$ as long as $N > 0$. Those solutions are the x-coordinates of the points of intersection for the functions $y = |x|$ and $y = N$. In this lesson, those values are referred to as *L* and *R*.

   a. Write an inequality for the solutions to the inequality $|x| < N$ using *L* and *R*.

   b. Write an inequality for the solutions to the inequality $|x| > N$ using *L* and *R*.

2. Write a statement for the solutions for each of the absolute value inequalities below:

   a. $|x| < 7$ b. $|x| > 3$

3. Write a statement for the solutions for each of the absolute value inequalities below:

   a. $|x| \leq 7$ b. $|x| \geq 3$

Problem 2:

In this problem, the absolute value inequalities are of the form $|x-a|<N$ and $|x-a|>N$. The *x*-coordinates for the points of intersection of $y=|x-a|$ and $y=N$ are still referred to as *L* and *R*.

4. Are the values of *L* and *R* opposites (additive inverses) of each other in this problem? Why or why not?

5. The solutions to the inequality $|x-a|<N$ are all of the values for *x* _____ the values of *L* and *R.*

6. Write a compound statement that gives the solutions to $|x-a|>N$.

7. Solve the following absolute value inequalities. Graph the related functions as needed to find the find/confirm the values of *L* and *R*.

a. $|x-1|>5$

b. $|x+4|<2$

c. $|x+6|\geq 10$

d. $|x-1|\leq 1$

Problem 3:

In this problem of the calculator lesson, the solutions to the absolute value inequalities are found without using the graphs of the functions $y = |x - a|$ and $y = N$.

9. For the inequality $|x - a| < N$, the locations of *L* and *R* are ___ units to the left and right of ___.

10. For the inequality $|x - 6| < 5$, the center of the solutions is at $x =$____ and the solutions begin at $x =$____ and end at $x =$____. (Values of *L* and *R*.)

11. For the inequality $|x - a| < N$, the solutions are described by which of the following statements? Circle the correct choice.

$L < x < R$ $\qquad\qquad$ $x < L \text{ or } x > R$

12. Solve the following inequalities:

a. $|x - 3| < 1$ $\qquad\qquad$ b. $|x + 5| > 2$

c. $|x + \pi| \leq 5$ $\qquad\qquad$ d. $|x - \sqrt{3}| \geq 7$

Problem 4:

13. Restate the problems with an equivalent absolute value inequality in which the coefficient of x is 1. Solve the inequality problems using your restatements.

a. $|3x-12|<9$

b. $|8-2x|>14$

Problem 5:

14. Describe the set of solutions for the inequality $|x|>-2$.

15. Describe the set of solutions for the inequality $|x|>0$.

16. Describe the set of solutions for the inequality $|x|<-1$.