Absolutely!

ID: 8791

Time required
45 minutes

Activity Overview

In this activity, students first solve linear absolute value equations in a single variable using the definition of absolute value to write and solve two equations. They then explore the handheld's functionalities for solving and checking such equations. Next, students view graphs of absolute value inequalities, compare them to those of compound inequalities, and practice writing absolute value inequalities as compound inequalities. Finally, students solve absolute value inequalities and check their solutions by graphing them with the handheld.

Topic: Linear Inequalities

- *Solve a linear inequality involving an absolute value and graph the solution set.*
- *Solve a compound inequality involving AND or OR and graph the solution set.*

Teacher Preparation and Notes

This activity is designed for use in an Algebra 1 or Pre-Algebra classroom.

- *Prior to beginning the activity, students should have experience solving and graphing compound inequalities.*
- *Notes for using the TI-Nspire™ Navigator™ System are included throughout the activity. The use of the Navigator System is not necessary for completion of this activity.*
- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to education.ti.com/exchange and enter "8791" in the keyword search box.***

Associated Materials

- *Absolutely_Student.doc*
- *Absolutely.tns*
- *Absolutely_Teacher.doc*

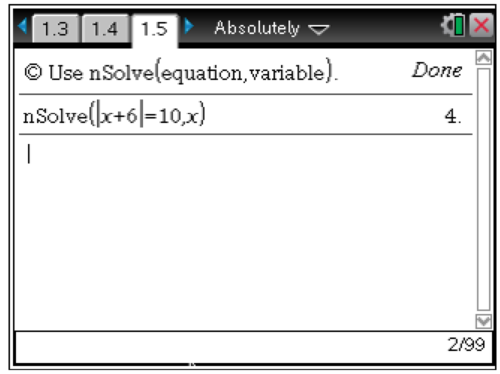
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Absolute Value Equations (TI-Nspire technology) — 12944*

Problem 1 – Solving absolute value equations

Review the definition of absolute value: *The absolute value of a number is its distance from zero.* Discuss the examples on pages 1.2 and 1.3. You may wish to complete a few additional examples with the whole class.

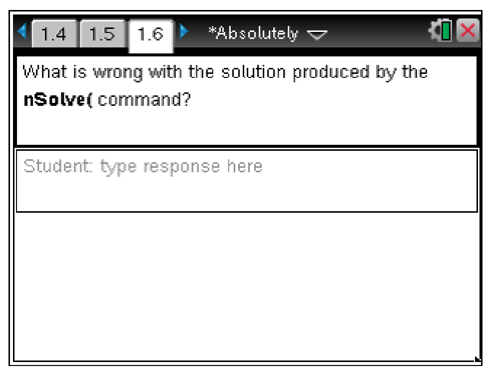


If students have not used the **nSolve(** command before, explain that it tries many different values for the variable until it finds a value that makes the equation true. Guide them to input the command on page 1.5 and discuss the questions on page 1.6. (The solution that the handheld gives is not *fully* correct because it gives only one solution and this equation has two solutions. It is incorrect because the **nSolve(** command stops as soon as it finds <u>one</u> *x*-value that makes the equation true. It does not look for any additional solutions.)

TI-Nspire Navigator Opportunity: *Screen Capture*

See Note 1 at the end of this lesson.

Page 1.6 asks the students to reflect on the results given when using the **nSolve(** command.



Have students work independently or in small groups to complete the exercises for Problem 1 on the worksheet, Problems 1-8 as directed on page 1.9.

TI-Nspire Navigator Opportunity: *Screen Capture*

See Note 2 at the end of this lesson.

Student Worksheet Solutions

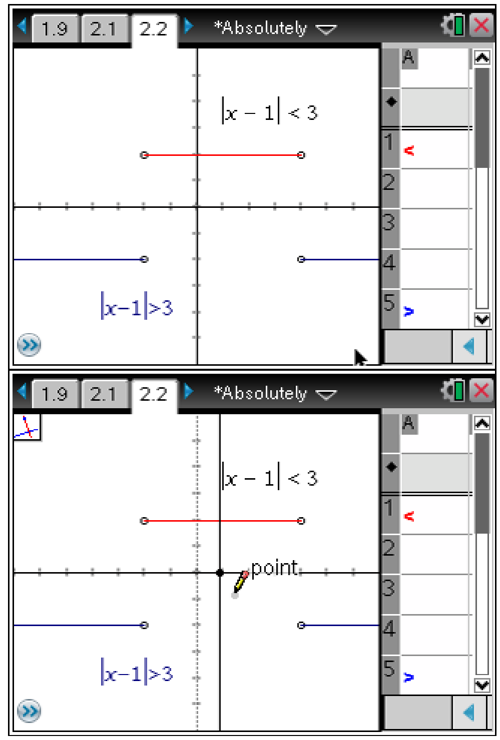
1. $x = 2$ or $x = -2$	**2.** no solution	**3.** $x = 4$ or $x = -4$	**4.** $x = 4$ or $x = -8$
5. $x = 5$ or $x = -5$	**6.** $x = -2$	**7.** $x = -6$ or $x = 12$	**8.** $x = 5$ or $x = -2$

Problem 2 –Absolute value inequalities

In this problem, students practice writing absolute value inequalities as compound inequalities before attempting to solve absolute value inequalities in Problem 3.

Take time to carefully review each element of the graphs on page 2.2 with the class. Explain that two graphs are shown on this page: one above the *x*-axis (number line) and one below. Review the meaning of the segments of the graph (they are above/below the *x*-values for which the inequality is true) and the open circles at the ends of the lines (the inequality is not true at these points).

How would we have to change the inequalities to make these circles closed instead of open?

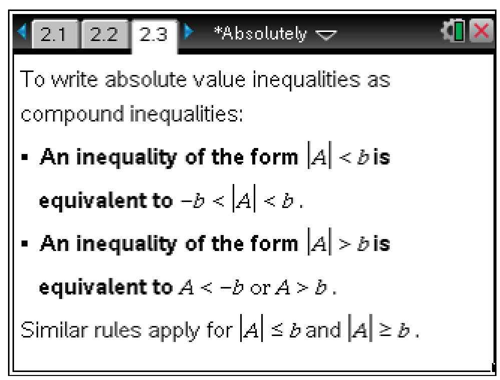


TI-Nspire Navigator Opportunity: *Screen Capture*

See Note 3 at the end of this lesson.

When you are satisfied that students understand each inequality graph, discuss the meaning of absolute value as a distance. Have students draw a vertical line at $x = 1$

(Select menu **> Construction > Perpendicular** and click twice on the number line where $x = 1$.) All of the points on the upper graph are less than 3 units away from the vertical line. All of the points on the lower graph are more than 3 units away from the line.



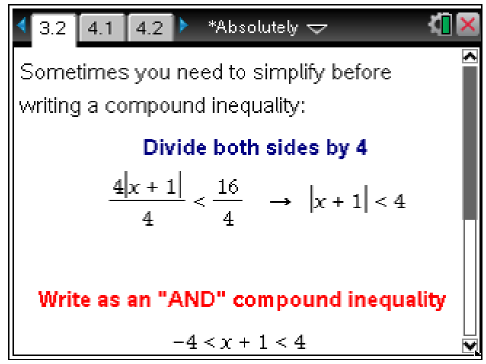
Then connect the absolute value inequalities with compound inequalities.

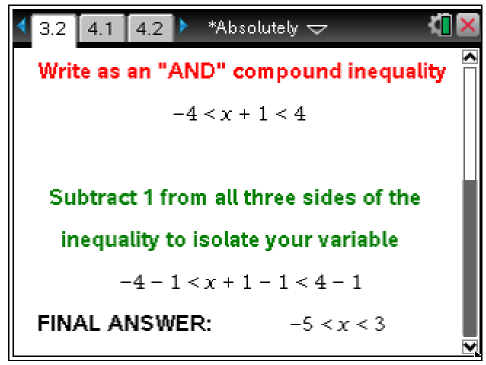
What compound inequality has the same graph as $|x - 1| < 3$*? As* $|x - 1| > 3$*?*

Review the rules for writing absolute value inequalities as compound inequalities on page 2.3. Then have students complete the exercises for Problem 2 on their worksheets.

Problem 3 – Solving absolute value inequalities I

On page 3.2, the students will be able to view the steps required to solve the inequality, $4|x - 1| < 16$, via the scroll bar to the right. Encourage them to predict what each subsequent step may look like. It is especially important that they realize how the compound inequality in Step 3 is developed.



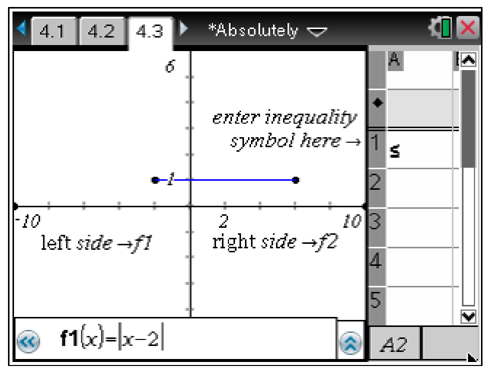


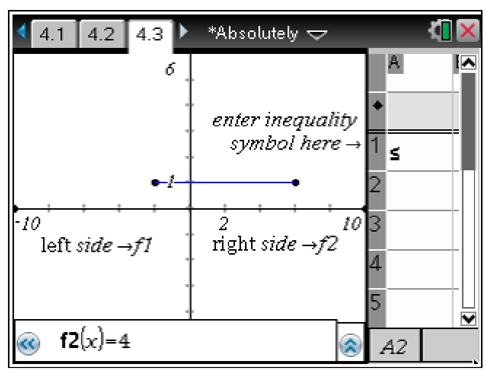
Problem 4 – Solving absolute value inequalities II

Page 4.3 allows for students to enter their own absolute value inequalities and view their solution graphs.

It is very important that the students understand the left side of the inequality is to be entered as **f1**(x) and right side as **f2**(x). Clicking on cell A1 will produce quotation marks (“ “) within which the student can enter any of the four inequality symbols.

At first, the default inequality is $|x - 2| \leq 4$. Students can easily select the appropriate function and edit either **f1**(x) or **f2**(x) to match whatever inequality they wish to solve.





TI-Nspire Navigator Opportunity: *Screen Capture*

See Note 4 at the end of this lesson.

Student Worksheet Solutions

9. c **10.** a **11.** f **12.** b **13.** e **14.** d

15. $x + 7 < -9$ or $x + 7 > 9$

16. $-6 \le 3x \le 6$

17. $x < -10$ or $x > 10$

18. $-4 < 2.5x < 4$

Student Worksheet Solutions

19. $x \le -11$ or $x \ge -5$

20. $1 \le x \le 3$

21. $-1 \le x \le 7$

22. $x < -2$ or $x > 7$

23. $x \le -2$ or $x \ge 5$

24. $x < -2$ or $x > -2$ (or $x \neq -2$)

25. $-6 < x < 12$

26. $-6 < x < 2$

TI-Nspire Navigator Opportunities

Note 1
Problem 1, *Screen Capture*
This would be a good place to do a screen capture to verify students are entering the correct syntax for the **nSolve(** function.

Note 2
Problem 1, *Quick Poll*
You may want to use Quick Poll to determine what conclusions the students are making regarding the results of using the **nSolve(** function.

Note 3
Problem 2, *Screen Capture*
This would be a good place to do a screen capture to verify students are correctly constructing the perpendicular line to the x-axis at $x = 1$.

Note 4
Problem 4, *Screen Capture*
A screen capture here can be helpful for the teacher to verify students are correctly editing the **f1**(x) and **f2**(x) entry lines and correctly designating the type of inequality in cell A1 by changing the symbol within the quotation marks.