Name: ___________________________________ Date: _________________

ABSOLUTE VALUE INEQUALITIES
ALGEBRA 2 WITH TRIGONOMETRY

Absolute value inequalities can be solved much in the same way that we solved quadratic inequalities. The key will be to first solve the associated equation and then test values.

***Exercise* #1:** Consider the absolute value inequality $|x-5|\le 2$.

(a) Find all solutions to the related equation $|x-5|=2$.

(b) Are the values of x you found in (a) part of the solution set of this inequality? Explain.

(c) Test values of x in the inequality that lie outside of the two values found in (a) and in between them.

(d) Generalize your results from (a) to write the solution set of this inequality in set-builder notation. Also, represent your solution on a number line.

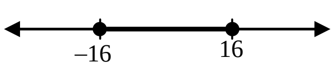
Just as with quadratic inequalities it suffices to simply test one point in each region of the x-axis to determine whether an inequality is true or false for an entire stretch of a number line.

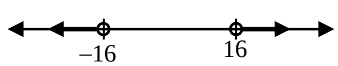
***Exercise* #2:** Solve each of the following inequalities. Represent your solution in both set-builder notation and on a number line.

(a) $|2x-1|\ge 11$

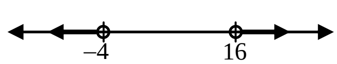
(b) $2|x-4|+3<19$

***Exercise* #3:** Which of the following number lines represents the solution to $|x-6|>10$?

(1) 

(3) 

(2) 

(4) 

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More challenging inequalities can exist when the absolute value is compared to a linear expression.

***Exercise* #4:** Solve each of the following inequalities algebraically. Represent your solution in both interval notation and on a number line.

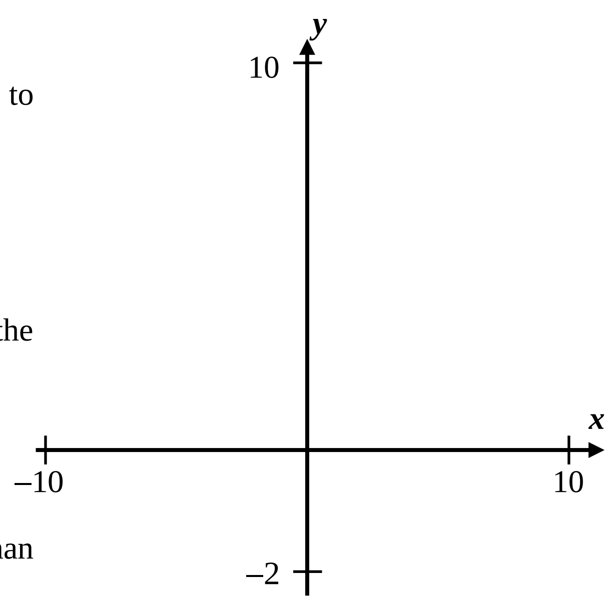
(a) $|x| \le x+8$

(b) $|2x+11| > x+19$

Absolute value inequalities can be solved algebraically, as we have just done, or graphically. The graphical solution compares the graphs of two functions in order to solve the inequality.

***Exercise* #5:** Consider the inequality $|x-4| > -\frac{1}{2}x+5$.

(a) Graph the functions $y=|x-4|$ and $y=-\frac{1}{2}x+5$ on the axes to the right for the window indicated.



(b) Use your calculator to determine the intersection points of the two curves. Label them on your graph.

(c) Over what values of x is the function $y=|x-4|$ greater than the function $y=-\frac{1}{2}x+5$? State your answer in set-builder notation.

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ABSOLUTE VALUE INEQUALITIES
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Which of the following values of *x* is in the solution set of $2|x+5|>15$?

(1) $x=0$ (3) $x=-1$

(2) $x=2$ (4) $x=-14$ __________

2. In which of the following inequalities is zero *not* contained within the solution set?

(1) $|x-10|>6$ (3) $|2x-7|<4$

(2) $|4x+1|\le 1$ (4) $3|x|+4>2$ __________

3. Which of the following represents the solution set of $|x|<10$?

(1) $[-10,10]$ (3) $(0,10]$

(2) $(-10,10)$ (4) $(-\infty,-10)\cup(10,\infty)$ __________

4. The solution set of the inequality $|x-2|\ge 7$ is

(1) $\{x\,|\,-5\le x\le 9\}$ (3) $\{x\,|\,x\le -5 \text{ or } x\ge 9\}$

(2) $\{x\,|\,-9<x<9\}$ (4) $\{x\,|\,x\le -9 \text{ or } x\ge 9\}$ __________

5. Solve each of the following inequalities *algebraically*. Express your answer both in set-builder notation and on a number line.

(a) $|x+10|<3$ (b) $|2x|+7\ge 15$

6. Solve each of the following inequalities algebraically. Represent your solution using interval notation and on a number line.

(a) $|2x-7| \le x+10$

(b) $|x+7| > -2x+1$

(c) $|2x-1| \ge x-11$

(d) $|3x+1| < x+11$

7. Solve each of the following inequalities graphically. Provide a graph to justify your solution. Be sure to label all curves drawn along with intersection points and your window.

(a) $|2-2x| > 6$

(b) $|x-2| \le 2x-7$