Name: _____ Date: _____

ABSOLUTE VALUE GRAPHS AND EQUATIONS
ALGEBRA 2 WITH TRIGONOMETRY

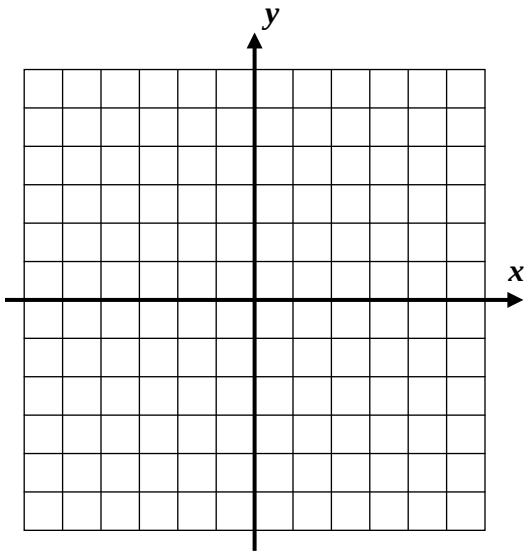
Although basic absolute value functions are not quadratic, they share enough similarities, in both their graphs and algebra, to be placed in this unit. We begin by examining basic absolute value graphs.

***Exercise* #1:** Consider the functions $y = |x|$, $y = |x-3|+2$, and $y = |x+1|-4$.

(a) Without the use of your calculator, graph $y = |x|$ on the axes provided. Label its equation.

(b) Using your calculator to generate a table of values, graph the other two absolute value functions above and label each with its equation.

(c) How would the graph of $y = |x|$ be shifted in order to produce the graph of $y = |x-6|-8$?



***Exercise* #2:** Which of the following would represent the range of the function $y = |x+8|-3$?

(1) $\{y \mid y \geq 3\}$ (3) $\{y \mid y \geq 8\}$

(2) $\{y \mid y \geq -3\}$ (4) $\{y \mid y \geq -8\}$

Solving linear equations involving absolute value is an important algebraic skill to develop in this course. It relies on a very fundamental fact developed in the next exercise.

***Exercise* #3:** Algebraically solve each of the following absolute value equations for all value(s) of *x*.

(a) $|x| = 8$ (b) $|x+7| = 3$ (c) $2|x| = 20$ (d) $3|x-4|+11 = 32$

***Exercise* #4:** Which of the following absolute value equations has no solution?

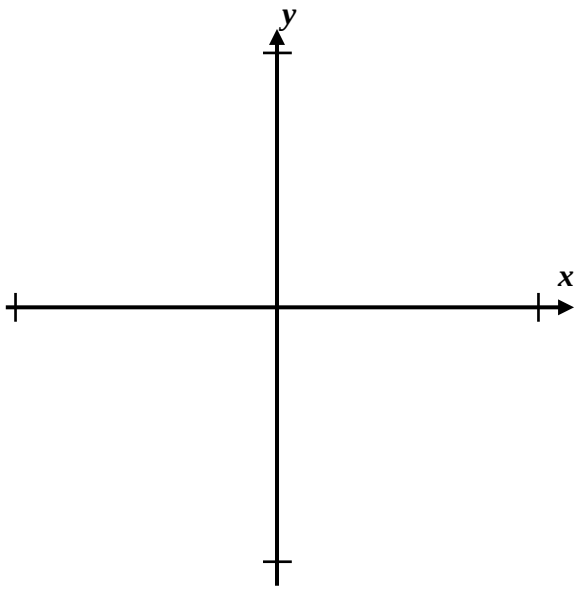
(1) $5|x|-3=8$ (3) $-4|x-2|+1=-11$

(2) $4|x+3|+6=2$ (4) $-3|x-1|+8=2$ _____

A more interesting case of absolute value equations occurs when the side not containing the absolute value contains a variable term.

***Exercise* #5:** Consider the equation $|x-1|=2x-5$.

(a) Use your calculator to solve this equation graphically. Sketch your graph on the axes given. Be sure to label all curves and your window.



(b) Solve this equation algebraically for all value(s) of *x*.

(c) Algebraically check your solutions in part (b) in the original equation. How does this check support your graphical solution?

***Exercise* #6:** Solve and check each of the following equations. Reject any extraneous roots.

(a) $|x-5|=2x+5$ (b) $|2x-1|=x+13$

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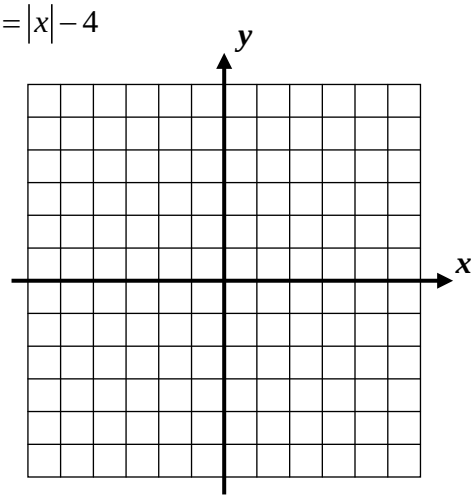
ABSOLUTE VALUE GRAPHS AND EQUATIONS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

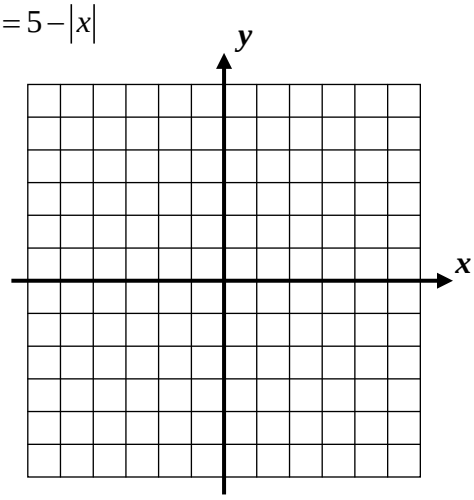
SKILLS

1. Create graphs for each of the following functions on the grids provided. Generate tables on your calculator if necessary.

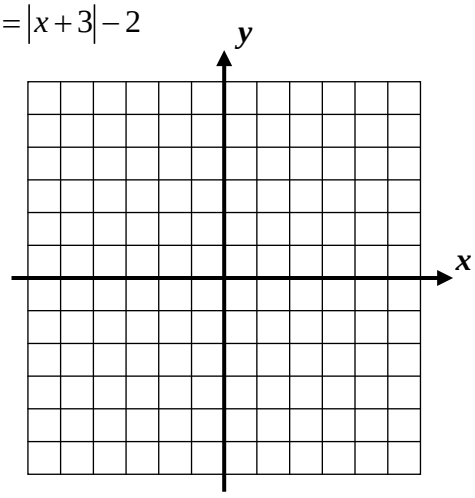
(a) $y = |x| - 4$



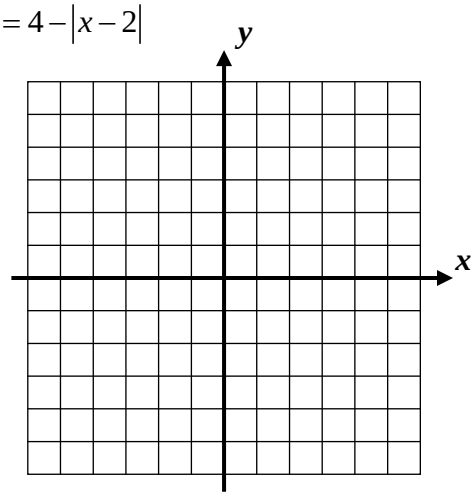
(b) $y = 5 - |x|$



(c) $y = |x + 3| - 2$



(d) $y = 4 - |x - 2|$



2. Which of the following represents the range of the function $y = |x - 2| - 5$?

(1) $[-5, \infty)$ (3) $[5, \infty)$

(2) $[2, \infty)$ (4) $[-2, \infty)$ _____

3. Which of the following lines would not intersect the graph of $y = 8 - |x|$?

(1) $x = -2$ (3) $y = 4$

(2) $y = 10$ (4) $x = 0$ _____

4. Solve each of the following absolute value equations for all value(s) of x. If no solution exists, state so.

(a) $|x+6|=15$ (b) $5|x+3|=20$ (c) $2|x|+7=3$

(d) $|3x-1|-4=10$ (e) $4|x-8|+10=2$ (f) $\frac{|2x+1|}{3}+4=10$

5. Solve and check each of the following absolute value equations. Be sure to reject any extraneous roots. If no solutions exist, state so.

(a) $|x+2|=-2x+11$ (b) $|2x+5|=x-8$

(c) $|x-4|=x-2$ (d) $|3x+4|=x+12$