Algebra Review
Absolute Value Functions

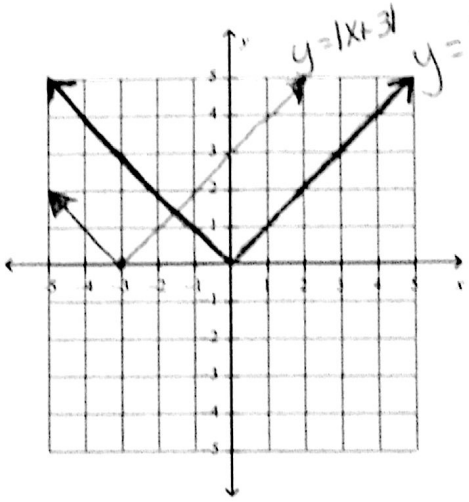
Name: Key
Date: _____

1. How are the graphs of $y = |x - 4|$ and $y = |x| - 4$ the same? How are they different? Both graphs translate. $y = |x-4|$ translates to the right 4 units. $y = |x| - 4$ translates 4 units down.

2. How are the graphs of $y = |x + 3|$ and $y = |x| + 3$ the same? How are they different? Both graphs translate 3 units. $y = |x+3|$ translates 3 units to the left and $y = |x| + 3$ translates 3 units up.

3. Identify the transformations of the graph of $y = |x + 3|$ compared to $y = |x|$ and graph them both

$y = |x+3|$ moves $y = |x|$ to the left 3 units



4. Given the following absolute value equations, tell whether they have one solution, no solution or two solutions. Explain.
   a. $|x + 4| + 4 = 8$ → $|x+4| = 4$ → 2 solutions b/c 4 is positive
   b. $|x - 2| + 3 = 1$ → $|x-2| = -2$ → ∅ b/c -2 is neg.
   c. $|x - 2| = 0$ → one solution. b/c $|\#| = 0$ is only 0

5. Write an equation for each transformation of $y = |x|$.
   a. Vertex is (5, 3) $y = |x-5| + 3$
   b. Vertically stretched (taller and narrower) $y = 5|x+2| - 1$
   c. Vertically shrunk (shorter and wider) $y = \frac{1}{3}|x+2| - 1$
   d. Reflection of $y = 3|x + 1| - 2$ $y = -3|x+1| - 2$

Anything less than 1 | Any vertex | Anything greater than 1

6. Solve each equation or inequality.

a. $5 = |w - 8|$

$w - 8 = 5$ OR $w - 8 = -5$

$+8 \quad +8 \qquad +8 \quad +8$

$w = 13$ OR $w = 3$

b. $\frac{6|5 - m|}{6} = \frac{48}{6}$

$|5 - m| = 8$

$5 - m = 8$ OR $5 - m = -8$

$-5 \quad -5 \qquad -5 \quad -5$

$-m = 3 \qquad -m = -13$

$m = -3$ OR $m = 13$

c. $|2x + 2| - 4 = 36$

$+4 \quad +4$

$|2x + 2| = 32$

$2x + 2 = 32$ OR $2x + 2 = -32$

$2x = 30 \qquad 2x = -34$

$x = 15$ OR $x = -17$

d. $|c + 3| > 6$

$c + 3 > 6$ OR $c + 3 < -6$

$-3 \quad -3 \qquad -3 \quad -3$

$c > 3$ OR $c < -9$

e. $\frac{2|e + 2|}{2} < \frac{-8}{2}$

$|e + 2| < -4$

$\emptyset$ ← cannot be < a neg.

f. $|4h| - 5 \geq 11$

$+5 \quad +5$

$|4h| \geq 16$

$4h \geq 16$ OR $4h \leq -16$

$h \geq 4$ OR $h \leq -4$

g. $|k + 4| > -3$

$\mathbb{R}$ ← everything is > a neg.

h. $\frac{7|p - 3|}{7} \leq \frac{14}{7}$

$|p - 3| \leq 2$

$p - 3 \leq 2$ and $p - 3 \geq -2$

$+3 \quad +3 \qquad +3 \quad +3$

$p \leq 5 \qquad p \geq 1$

$1 \leq p \leq 5$

7. Write and solve an absolute value equation or inequality for each situation.

a. The ideal weight of a tree stand is 6.5 lbs. Each stand can have an error of at most 0.5 lb. What is the range of acceptable weights?

$|w - 6.5| \leq 0.5$

$w - 6.5 \leq 0.5$ and $w - 6.5 \geq -0.5$

$+6.5 \quad +6.5 \qquad +6.5 \quad +6.5$

$w \leq 7 \qquad w \geq 6$

$6 \leq w \leq 7$

b. A box of crackers should have a mass of 13.7 oz. The quality control inspector measures the mass of every fiftieth box. The inspector rejects any box that is not within 0.3 oz of the ideal mass. Find the range of acceptable masses.

$|m-13.7| \leq 0.3$

$m-13.7 \leq 0.3$ and $m-13.7 \geq -0.3$

$+13.7 \quad +13.7 \qquad +13.7 \quad +13.7$

$m \leq 14 \qquad m \geq 13.4$

$13.4 \leq m \leq 14$

c. A school bus is traveling at a rate of 30 mph is 10 miles from Jasper's house. At what time(s) is the school bus 1 mile from Jasper's house?

$|10-30x| = 1$

$10-30x = 1$ OR $10-30x = -1$

$-10 \quad -10 \qquad -10 \quad -10$

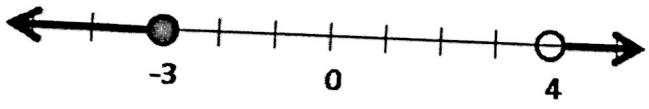
$-30x = -9 \qquad -30x = -11$

$x = \frac{-9}{-30} \qquad x = \frac{-11}{-30}$

$x = .3 \qquad x = .3\overline{6}$

.3 or $.3\overline{6}$ of a hour

7. Which of the following inequalities could be represented by the graph?



NO ANSWER - NONE COULD

I. $|n-1| > 2$

$n-1 > 2$ OR $n-1 < -2$

$n > 3 \qquad n < -1$

II. $-4x \geq 12$ or $-x < 4$

$x \leq -3 \qquad x > -4$

III. $1 < 3h+4 < 13$

$1 < 3h+4$ and $3h+4 < 13$

$-3 < 3h \qquad 3h < 9$

$-1 < h \qquad h < 3$

8.

a. Explain the steps to solve an absolute value inequality. Be sure to explain the differences in an AND statement and an OR statement. You may use an example to help explain.

First, get the Absolute Value alone on one side of the equal sign. If it is $<$ or $\leq$, solve 2 inequalities like this:

$ax+b < c$ AND $ax+b > -c$

If it is $>$ or $\geq$, Solve 2 inequalities like this: $ax+b > c$ OR $ax+b < -c$

b. What is the difference between solving an absolute value equation vs. inequality?

Absolute Value EQUATIONS are always OR situations

Absolute Value INEQUALITIES are OR when $\geq$ & $>$

and they are AND for $\leq$ & $<$.