Name: Date: Period:

Graphing Absolute Value Equations in the form: $g(x) = a|x - h| + k$

Four major considerations for graphing absolute value equations in vertex form…

1. **Finding the vertex:** $g(x) = 2|x + 3| - 5$

   The **opposite** of the number **inside** the brackets is your **x-value** of your vertex and the number **added or subtracted** to the absolute value is the **y-value** of your vertex.

   The vertex of the above equation is (-3, -5)

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2. **Drawing the "V":**

   The coefficient in front of x (inside OR outside the brackets), is considered the "slope" and tells you how many units you must move up or down **AND** right and left. If there is a number **BOTH** inside **AND** outside the bracket, see #4 below to determine the correct slope.

   - If the coefficient is 3, you go **up** 3 and right **and** left 1.
   - If the coefficient is -3, you go **down** 3 and right **and** left 1.
   - If the coefficient is $\frac{1}{2}$, you go **up** 1 and right **and** left 2.

   Move up or down* **AND Both** left and right to plot the next sets of points. Repeat to plot several points before extending your lines.

***(Remember the SIGN OUTSIDE the absolute value brackets determines whether you move up or down from the vertex, not the coefficient of x)**

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3. **Finding the VERTEX when you have a coefficient ≠ 1 INSIDE the absolute value brackets:**

   The "x" value of the vertex must be CALCULATED when you have a coefficient other than 1 INSIDE the brackets.

   $$g(x) = 2|3x + 6| - 4$$

   To calculate, set what's between the absolute value bars equal to 0 and solve for x.

   $$3x + 6 = 0$$
   $$3x = -6$$
   $$x = -2$$

   The x-coordinate of the vertex is -2.

   Note: the y-coordinate of the vertex is just the number that's added to the absolute value term, in this case -4, because when you substitute the x-coordinate the absolute value term will always be 0.

   The vertex is (-2, -4)

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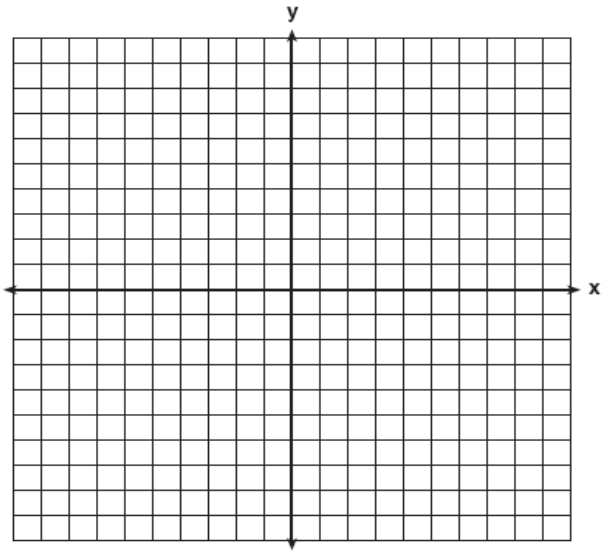
4. **Finding the slope when you have a coefficient INSIDE AND OUTSIDE the absolute value brackets*:**

   You must **distribute** to determine the correct slope. Look at the above example. After you plot the vertex, (-2, -4), you would go up 6 and right and left 1 to plot the next set of points because you must multiply the 2 by 3.

   *Exception to this is when you have a negative coefficient INSIDE the absolute value brackets (check in calculator).

To find the **domain**, figure out what **x-values** are appropriate for the function (usually all real numbers)
To find the **range**, figure out what **y-values** are appropriate for the function (it helps to look at your vertex)

Consider the following examples:



Example 1: $y = \frac{1}{3}|x| + 2$

1. Vertex:

2. No Negative sign in front tells me the "V" goes _____.

3. Slope is _____, so from the vertex move _____ and BOTH RIGHT AND LEFT _____.

   Use Interval Notation to identify:

   Domain: _____

   Range: _____

Example 2: $y = -3|x - 3| + 5$

1. Vertex:

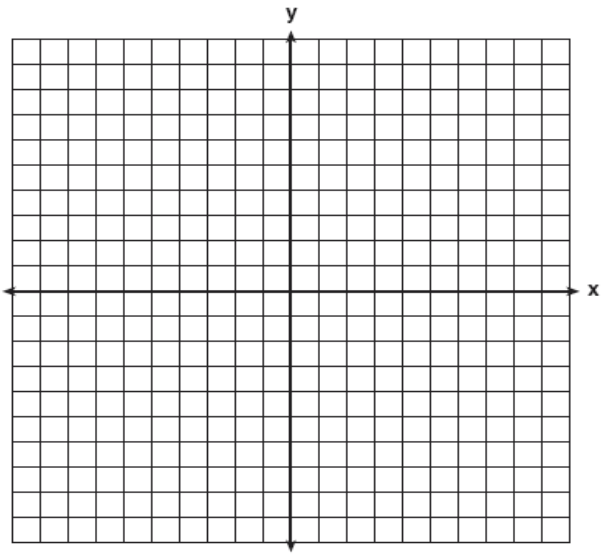
2. Negative sign in front tells me the "V" goes _____.

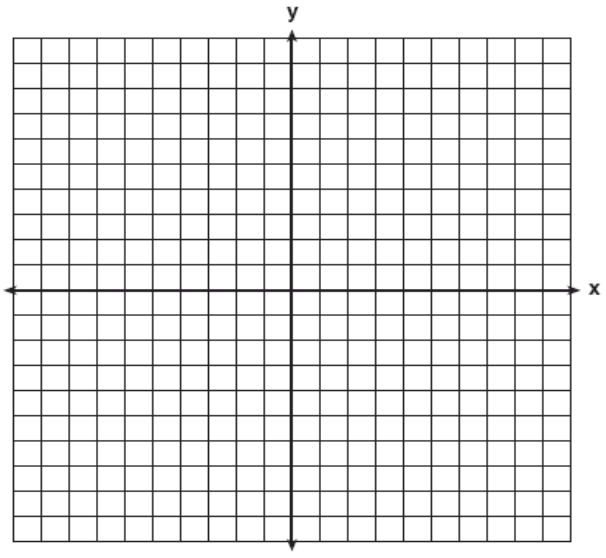
3. Slope is _____, so from the vertex move _____ and BOTH RIGHT AND LEFT _____.

   Use Interval Notation to identify:

   Domain: _____

   Range: _____





Example 3: $y = -\frac{1}{2}|2x + 4| - 3$

1. Vertex:

2. Negative sign in front tells me the "V" goes _____.

3. Slope is _____, so from the vertex move _____ and BOTH RIGHT AND LEFT _____.

   Use Interval Notation to identify:

   Domain: _____

   Range: _____