Translating Absolute Value Functions
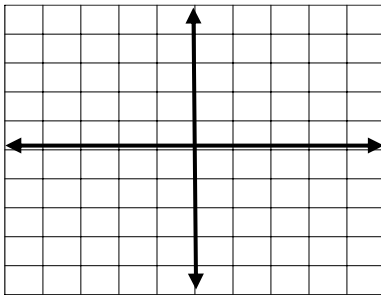
Name_____   Date_____

| **Graphing Absolute Value Functions** | Graph the following piecewise function by hand:

(1) $f(x) = \begin{cases} x & if \ x \geq 0 \\ -x & if \ x < 0 \end{cases}$

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WINDOW
Xmin=-5
Xmax=5
Xscl=1
Ymin=-5
Ymax=5
Yscl=1
Xres=1
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(2) On your graphing calculator graph the function $f(x) = |x|$ with this WINDOW and answer the following questions. *(Note: Absolute value is under MATH > NUM > 1: abs(, so in your calculator you will type $y_1 = abs(x)$)*

   a.   Compare the graph to the graph in #1 above. What is the relationship between the two?

   b.   What is the shape of the graph?

   c.   What is the slope of the two lines that create the graph?

   d.   What is the vertex of the graph?

   e.   What is the domain and range?

   f.   What is the axis of symmetry?
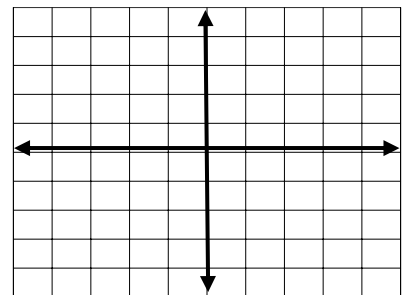
| **Translating Graphs of Absolute Value Functions** | The following graphs are transformations of the parent function $f(x) = |x|$ in the form $f(x) = a|x - h| + k$. Graph each on your calculator and sketch below and observe the type of transformation.
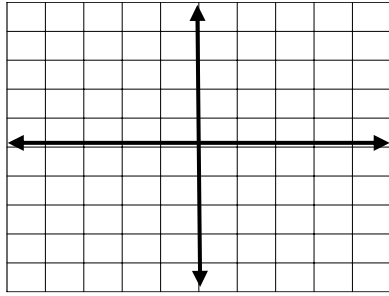
(3) $f(x) = |x| - 4$
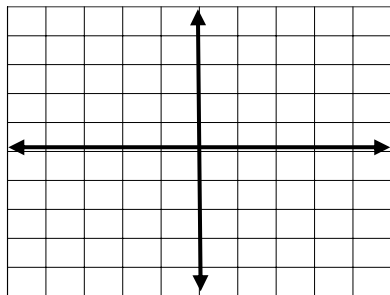
(4). $f(x) = |x| + 2$

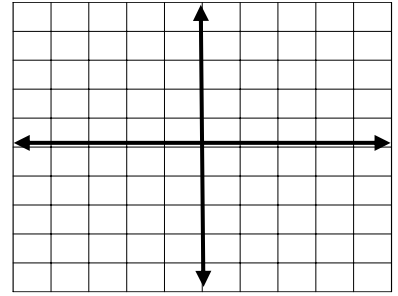(5) What happens to the graph when you subtract a number from the function? (i.e. $f(x) - k$)

(6) What happens to the graph when you add a number to the function? (i.e. $f(x) + k$)

Unit 1, Activity 7, Translating Absolute Value Functions Discovery Worksheet

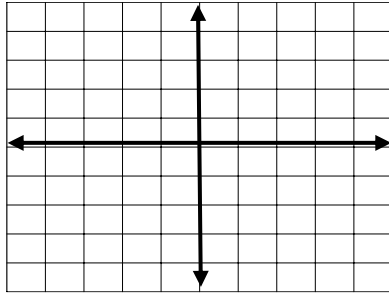(7) $f(x) = |x - 4|$

$f(x) = |x + 2|$

(8)

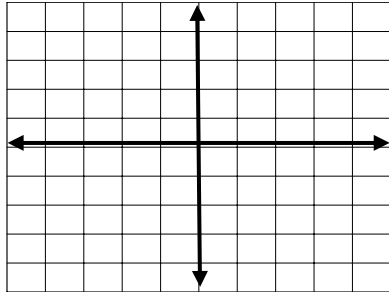(9) What happens to the graph when you subtract a number _in_ the function? (i.e. $f(x - h)$)

(10) What happens to the graph when you add a number _in_ the function? (i.e. $f(x + h)$)
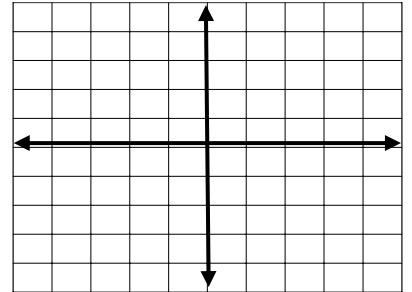
(11) $f(x) = -|x|$

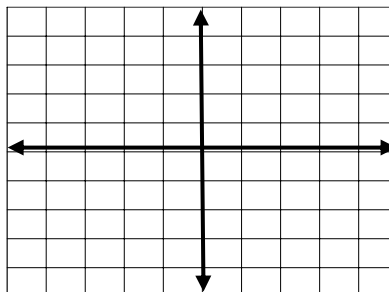(12) What happens to the graph when you take the opposite of the function? (i.e. $-f(x)$)
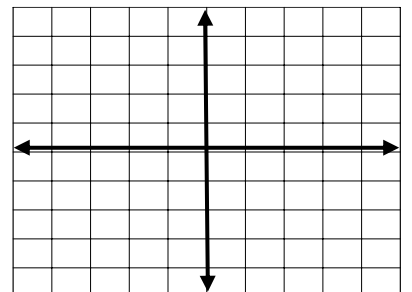
(13) $f(x) = 2|x|$

(14) $f(x) = \frac{5}{2}|x|$

(15) $f(x) = \frac{1}{2}|x|$

(16) $f(x) = \frac{2}{5}|x|$

17) What happens to the graph when the function is multiplied by a number greater than 1?

(18) What happens to the graph when the function is multiplied by a number between 0 and 1?

(19) These graphs are in the form *af(x)*. What does the "*a*" represent in these graphs?

Synthesis Write an equation for each described transformation.

(20) a V-shape shifted down 4 units: *f(x)* = _____

(21) a V-shape shifted left 6 units: *f(x)* = _____

(22) a V-shape shifted right 2 units and up 1 unit: *f(x)* = _____

(23) a V-shape flipped upside down and shifted left 5 units: *f(x)* = _____

Analysis <u>Describe</u> the transformation that has taken place for the parent function $f(x) = |x|$.

(24) $f(x) = |x| - 5$ _____

(25) $f(x) = 5|x + 7|$ _____

(26) $f(x) = -\dfrac{1}{4}|x|$ _____

(27) $f(x) = |x - 4| + 3$ _____

(28) Graph the function $f(x) = 2|x - 1| - 3$ without a calculator and answer the following questions:

a. What is the shape of the graph?

b. What is the vertex of the graph and how do you know?

c. Does it open up or down and how do you know?

d. What are the slopes of the two lines that create the graph?

e. What is the domain and range?

f. What is the axis of symmetry?