

Algebra 2

Lesson 2-5: Absolute Value Functions and Graphs, Vertical Stretch/Vertical Shrink

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Last class we saw how the (h, k) values affected the absolute value function. Today, we are going to look at the effects of the leading coefficient "a."

The parent function is

$$y = |x|$$

General form:

$$f(x) = a|x - h| + k$$

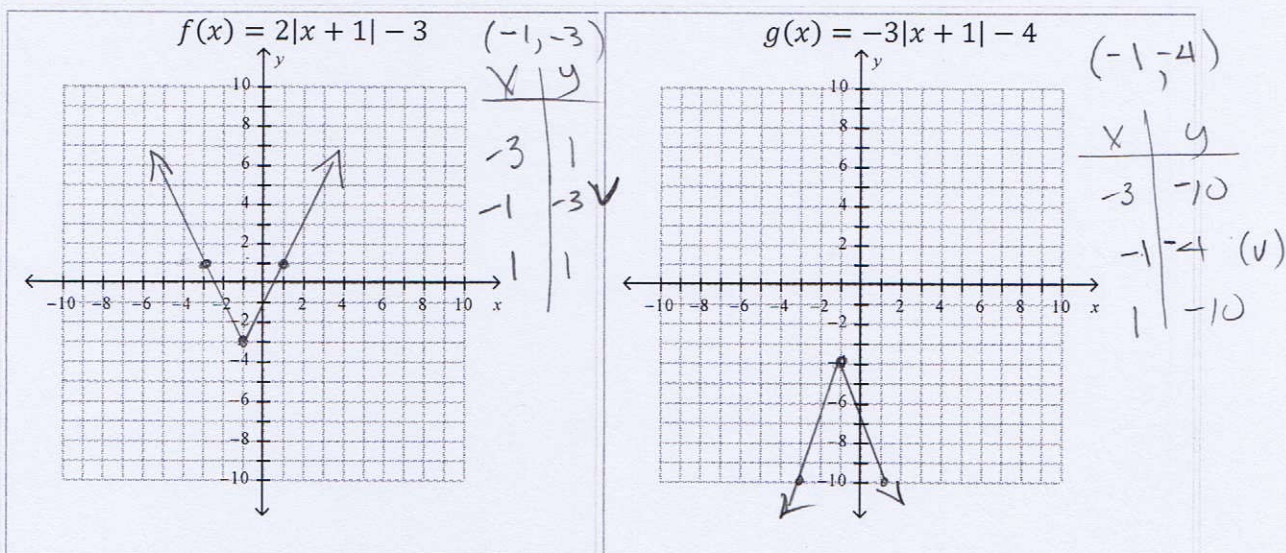
Vertex is: (h, k)

$a = \text{vertical stretch/shrink}$

In Algebra I the slope of the line is identified as m , the slope is the vertical stretch/shrink of a line. It manifests itself as a steepening or flattening of the line. In an absolute value function the leading coefficient will stretch or shrink the absolute value. The effect is like that of a line.

- $+a$ is a vertical stretch. The sides of the AV will get steeper by a factor of a .
- $-a$ is a vertical shrink. The sides of the AV will get flatter by a factor of a .

Graph and state the domain and range.



Given the form:

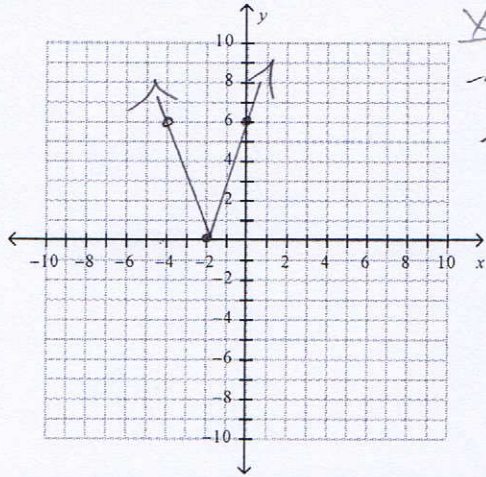
$$y = |mx + b| + c$$

vertex: $\left(-\frac{b}{m}, c\right)$

Sometimes the absolute value will have a coefficient next to the x-variable. Here we use the above listed form to determine the vertex. To graph make a table of values; choose points on each side of the vertex.

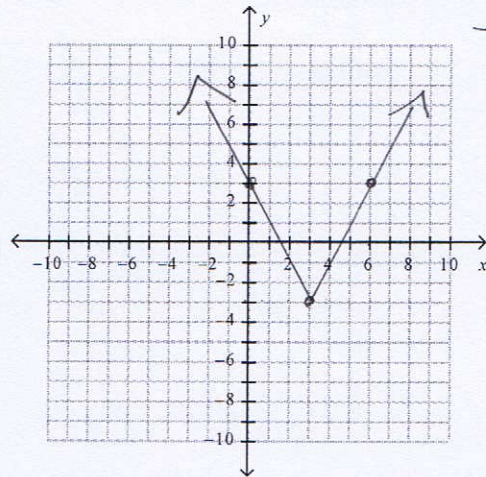
Find the vertex and graph.

$(-2, 0)$ $y = |3x + 6| + 0$
 $h = -\frac{b}{a} = -\frac{6}{3} = -2$
 $k = 0$



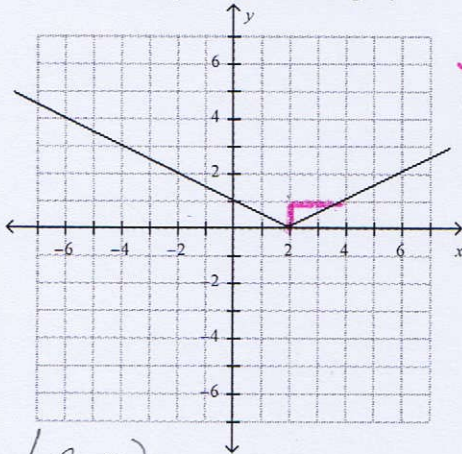
x	y
-4	6
-2	0
0	6

$y = |-2x + 6| - 3$ $(3, -3)$
 $h = \frac{-b}{a} = \frac{-6}{-2} = 3$



x	y
0	3
3	-3
6	3

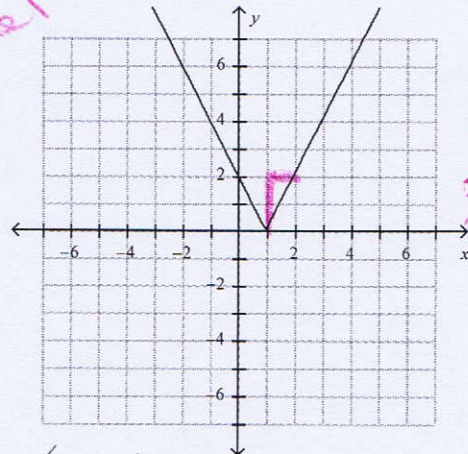
What is the equation for the graph:



*Vertical
Shrink
1/2*

$(2, 0)$

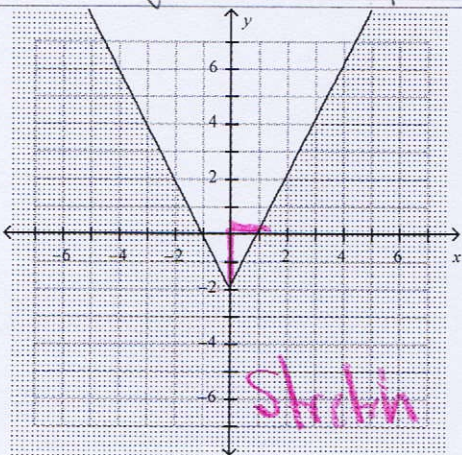
$y = \frac{1}{2} |x - 2|$



*Vertical
Stretch
2*

$(1, 0)$

$y = 2 |x - 1|$



Solid
Shaded down } $y \leq$

$(0, -2)$

Stretch 2
 $y \leq 2|x| - 2$