Math-2A
Lesson 4-10

The Absolute Value Function

Transformation: an adjustment made to the parent function that results in a change to the graph of the parent function.

Changes could include:

shifting the graph up or down,

Shifting the graph left or right

vertical stretching or shrinking

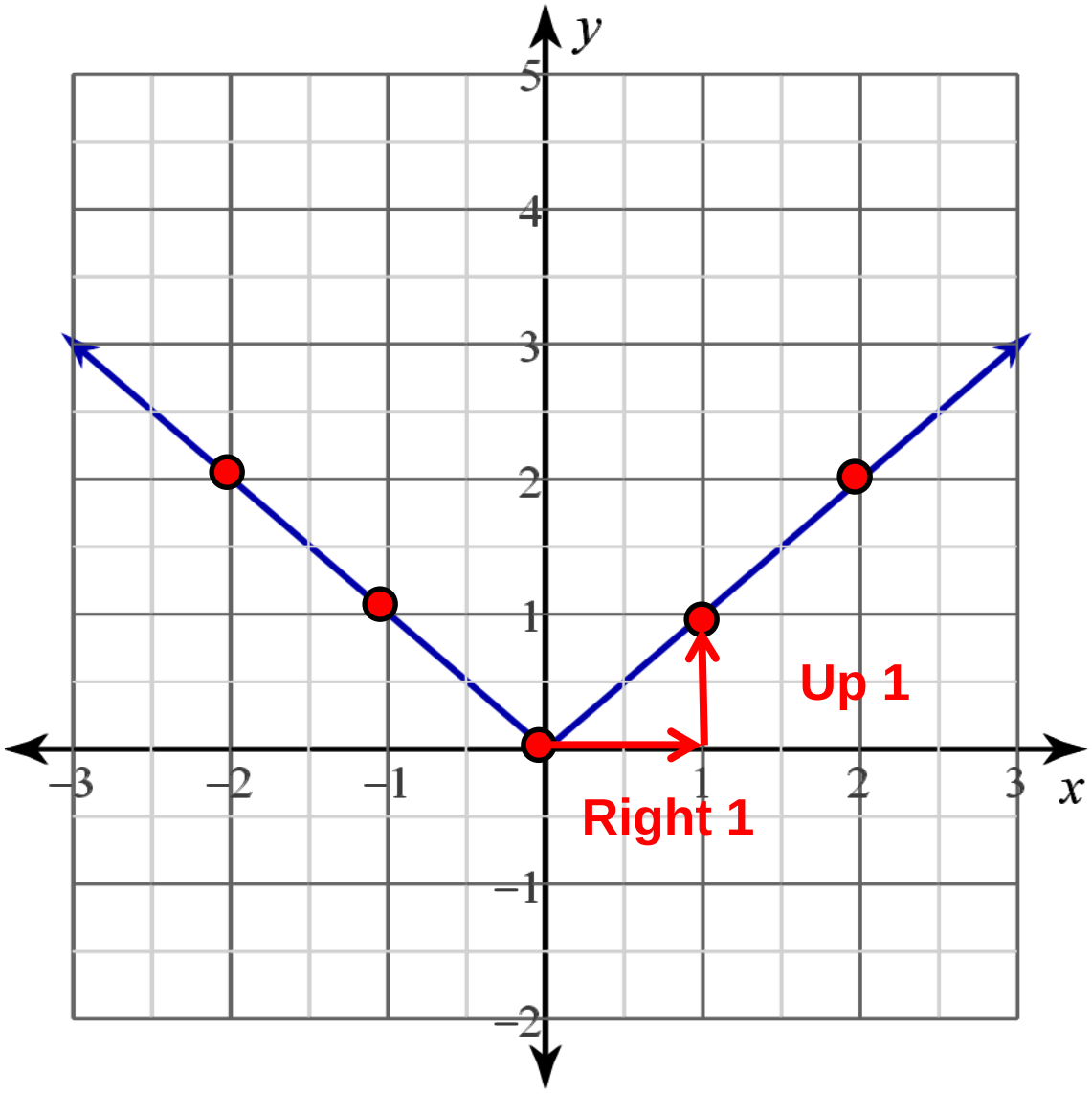
Reflecting across x-axis or y-axis

Absolute Value Function

$$f(x) = |x|$$

Build a table of values for each equation for domain elements: -2, -1, 0, 1, 2.

x	y
-2	2
-1	1
0	0
1	1
2	2



$f(x) = |x|$

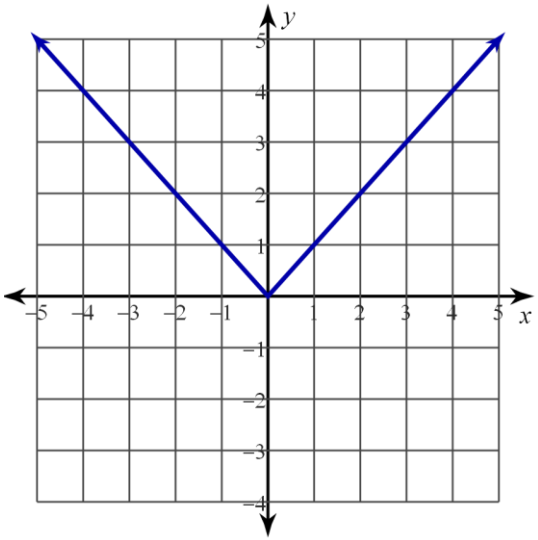
x	y
-2	2
-1	1
0	0
1	1
2	2

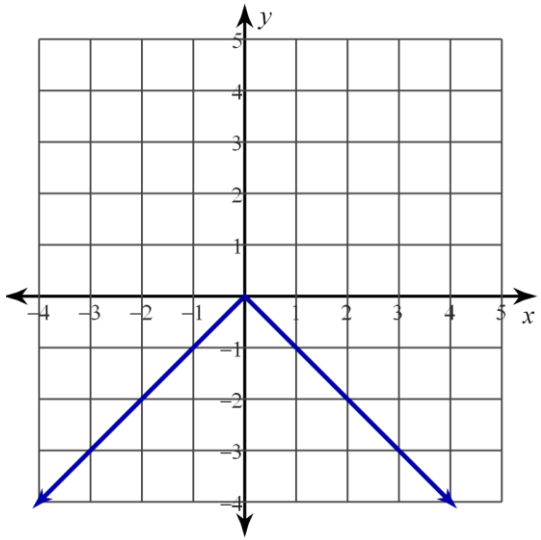
$g(x) = -|x|$

x-	y
-2	-2
-1	-1
0	0
1	-1
2	-2

Multiplying the parent function by -1 reflects it across the x-axis.

What is the vertex?





$f(x) = |x|$

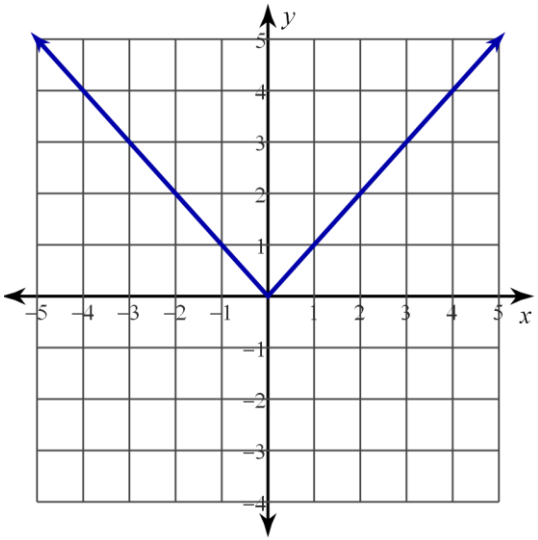
x	y
-2	2
-1	1
0	0
1	1
2	2

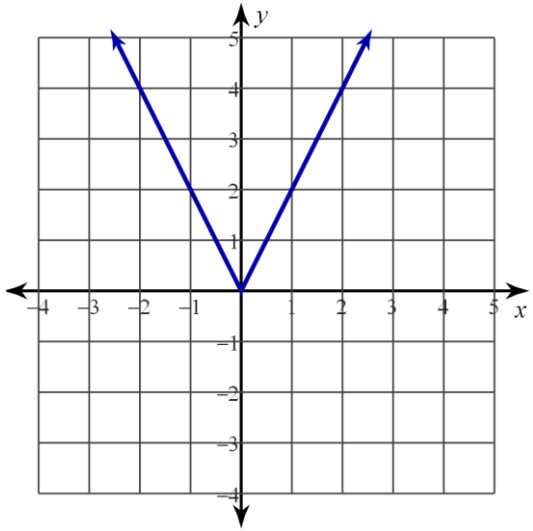
$g(x) = 2|x|$

x	y
-2	4
-1	2
0	0
1	2
2	4

Multiplying the parent function by 2 makes each y-value of the parent 2 times as big; VSF = 2

What is the vertex?





$f(x) = |x|$

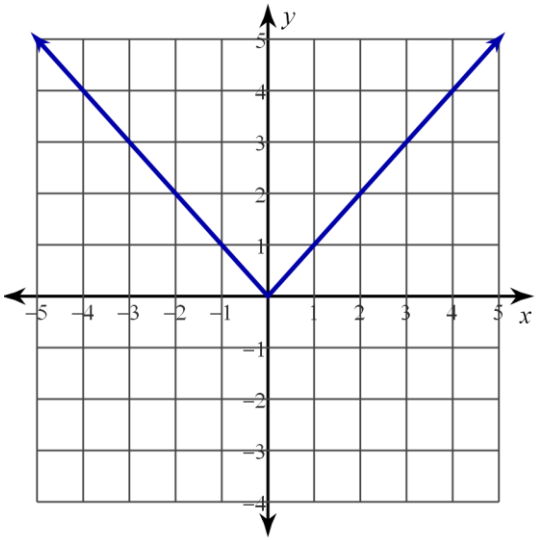
x	y
-2	2
-1	1
0	0
1	1
2	2

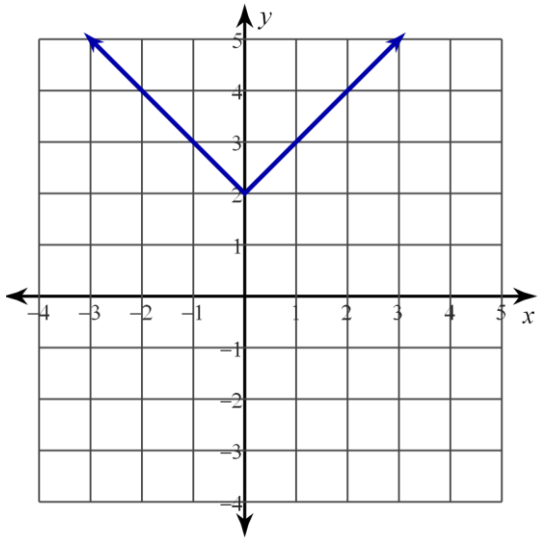
$g(x) = |x| + 2$

x	y
-2	4
-1	3
0	2
1	3
2	4

Adding 2 to the parent function causes the graph to translate ***up 2***

What is the vertex?





$f(x) = |x|$

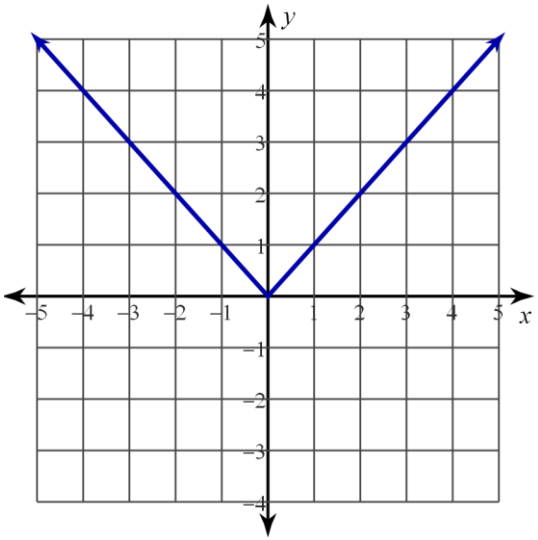
x	y
-2	2
-1	1
0	0
1	1
2	2

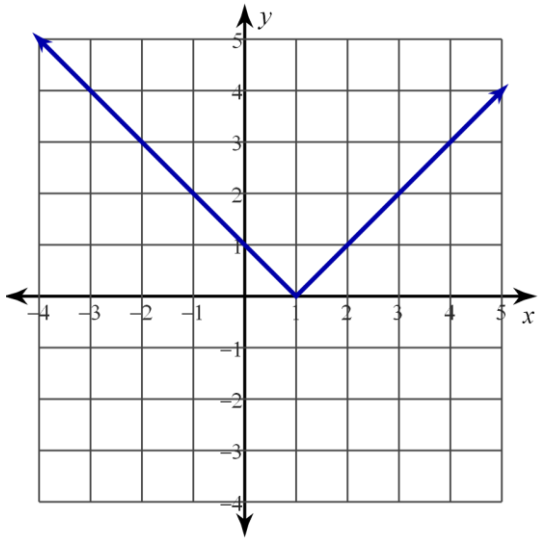
$g(x) = |x - 1|$

x	y
-2	3
-1	2
0	1
1	0
2	1

Replacing ‘x’ in the parent function with ‘x – 1’ causes the graph to translate ***right ‘1’***

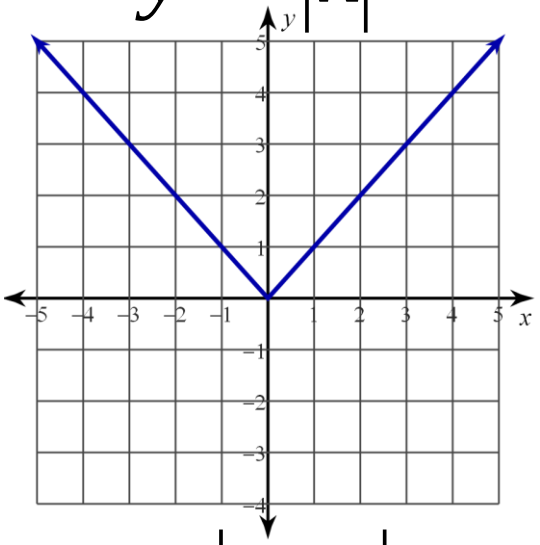
What is the vertex?





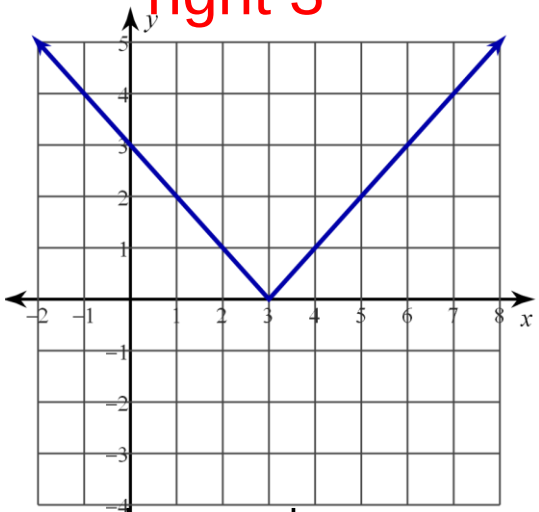
What is the transformation to the parent function?

$y = |x|$



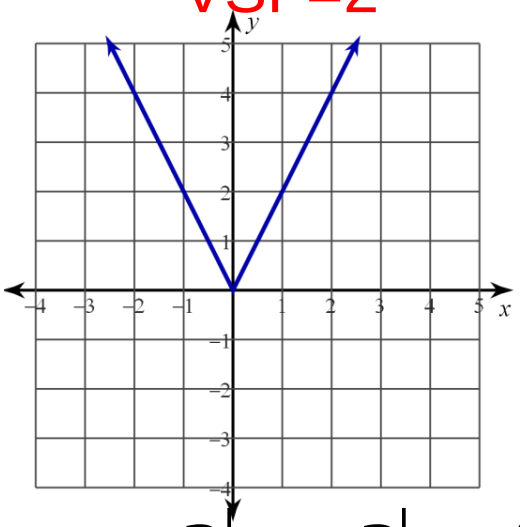
$y = |x - 3|$

right 3



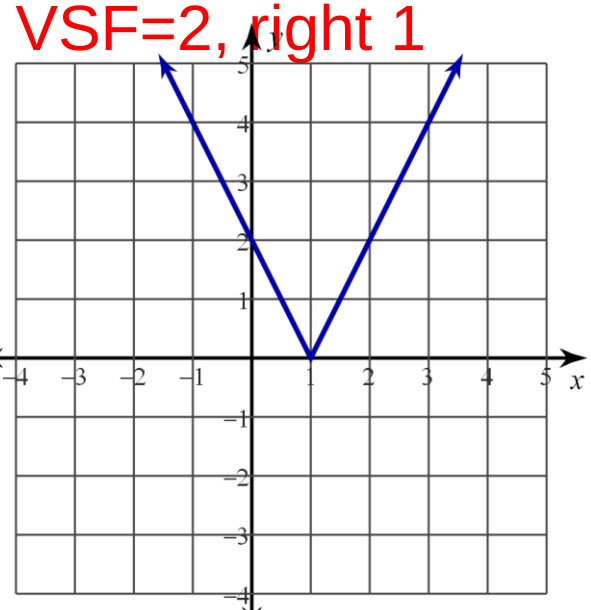
$y = 2|x|$

VSF=2



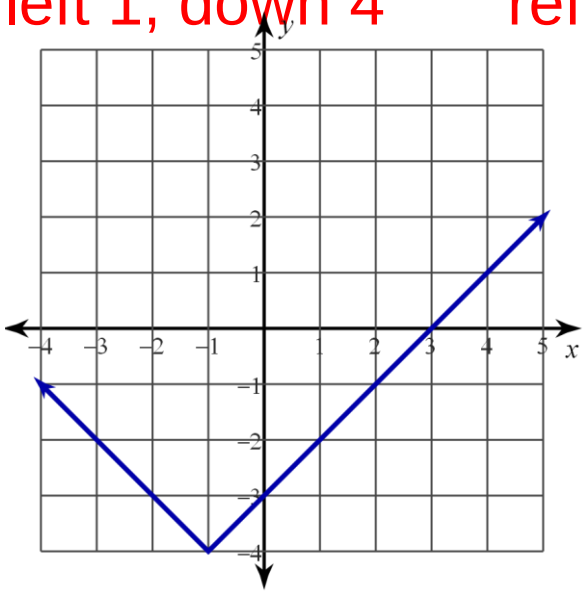
$y = 2|x - 1|$

VSF=2, right 1



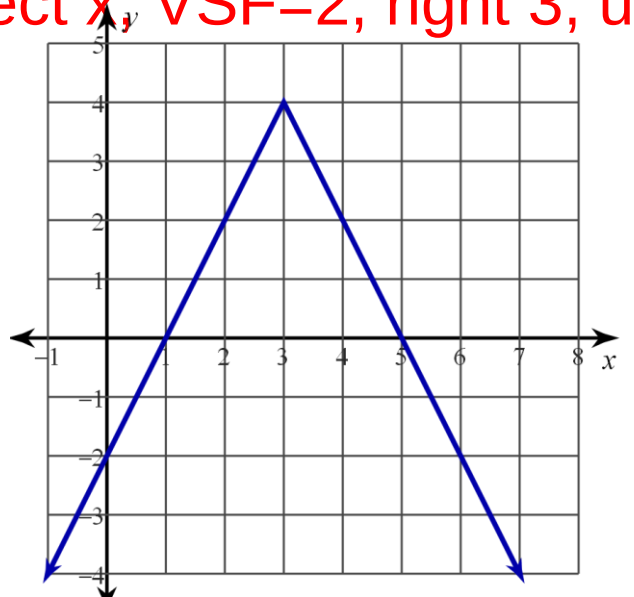
$y = |x + 1| - 4$

left 1, down 4



$y = -2|x - 3| + 4$

reflect x, VSF=2, right 3, up 4



Reflection across x-axis

Vertical stretch factor

Shift left/right

shift <u>up</u> or <u>down</u>

$y = |x|$ $\qquad y = (-1)a|x-h|+k$

$f(x) = |x| + k$ **Vertical shift**

$f(x) = |x-h|$ **Horizontal shift**

$f(x) = a|x|$ **Vertical stretch**

$f(x) = -|x|$ **Reflection across x-axis**

$f(x) = -5|x-2|+3$

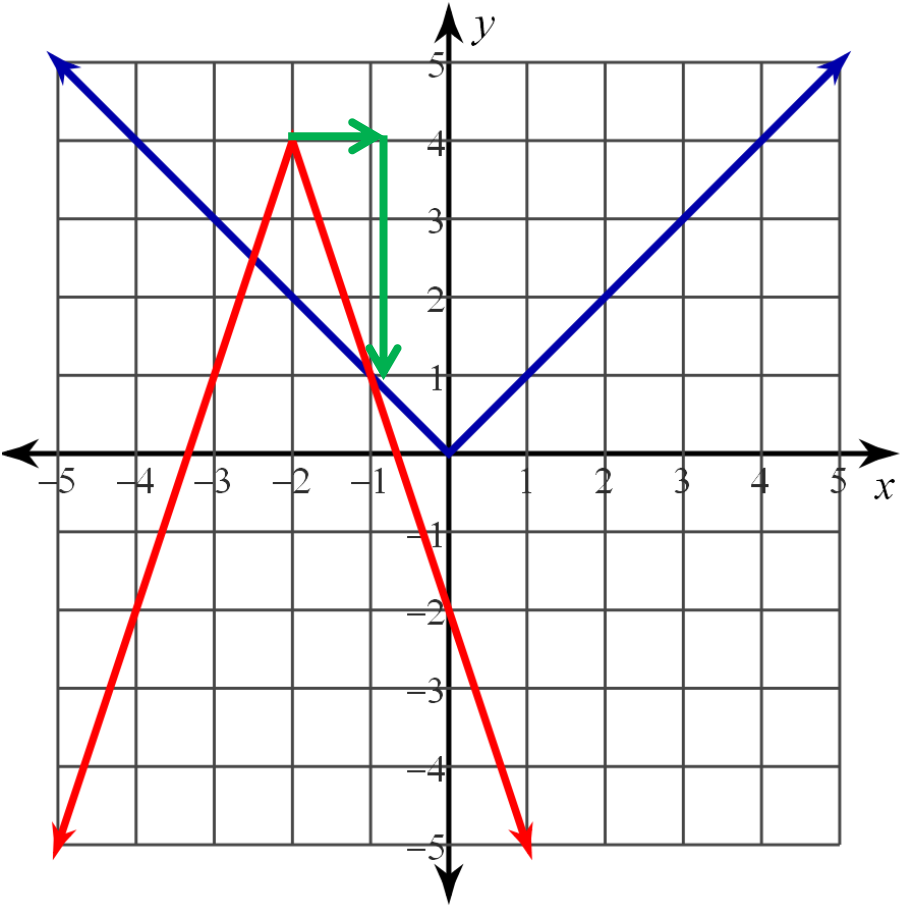
reflected (x-axis)

VSF=5, right 2 up 3

To compare the equation to the graph: $f(x) = |x|$

1) Move the vertex left/right and up/down

Vertex has moved left 2 and up 4. $g(x) = |x+2| + 4$



2) Shape of the graph: from the vertex move right 1, then up/down by the VSF.

From the Vertex move right 1, then to reach the graph you must move down 3

Reflect x-axis, VSF=3.

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