Math-2

Lesson 4-1

Relations and Functions

And the Absolute Value Function

Relation: A "mapping" or pairing of input values to output values.

Function: A relation where each input has exactly one output.

Describe how a relation is

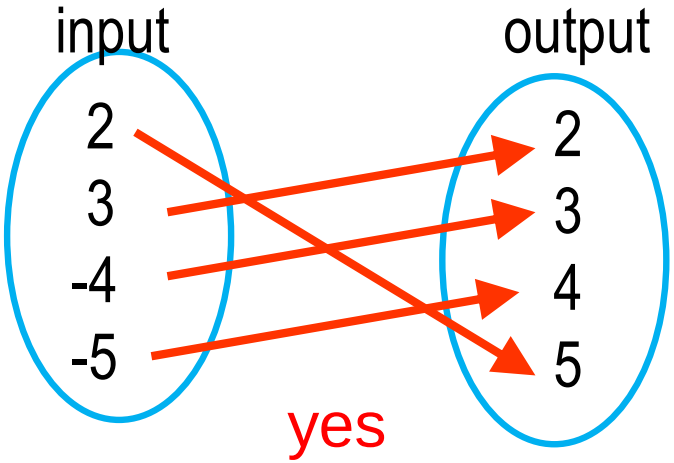
1) Similar to a function.

   Both have inputs matched to outputs.

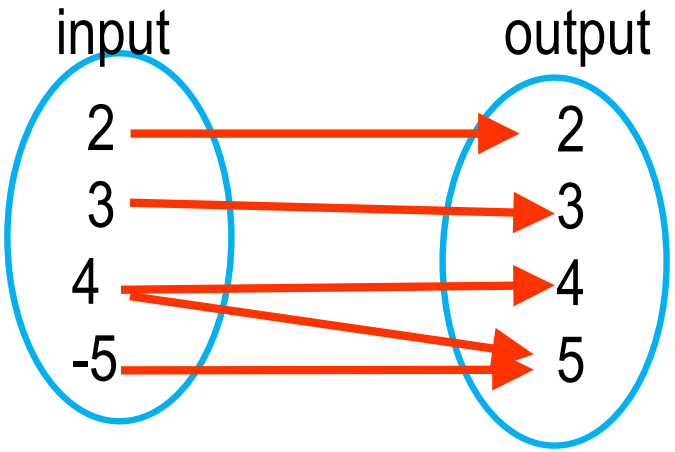
1) Different from a function?

   One input to a relation can be matched with two or more outputs but one input to a function can only be matched to one output.

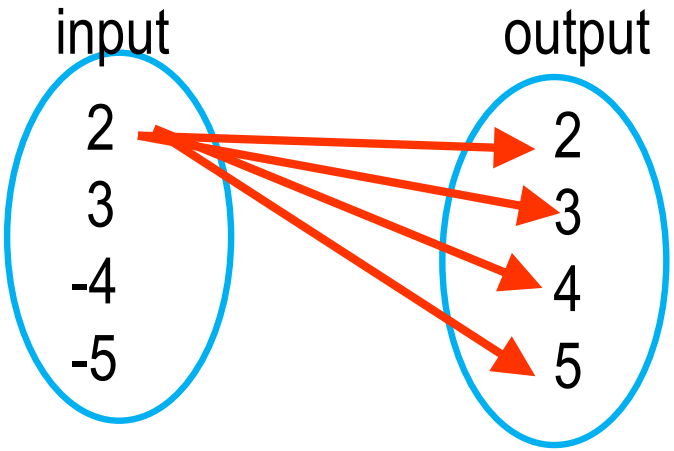
Is it a function?



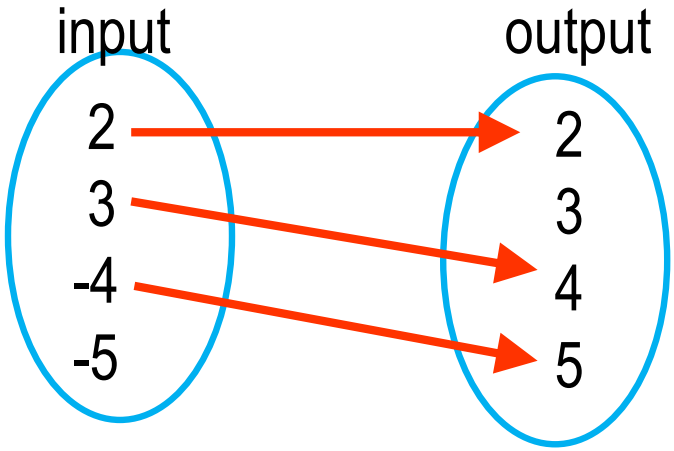
yes



Relation but NOT a function since input value ‘4’ has 2 outputs.

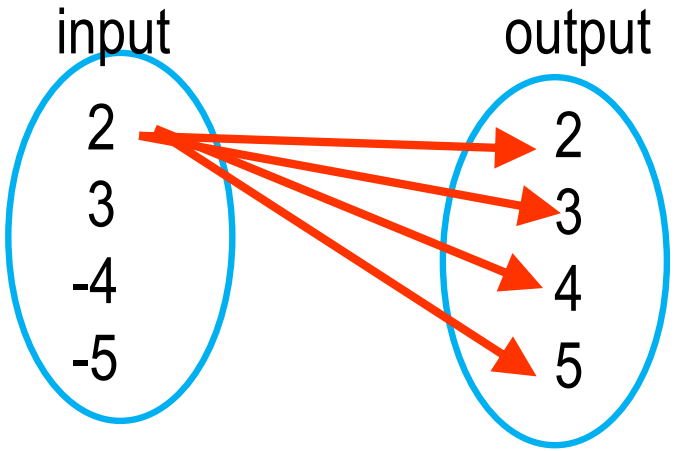


No: input value ‘2’ has more than one output

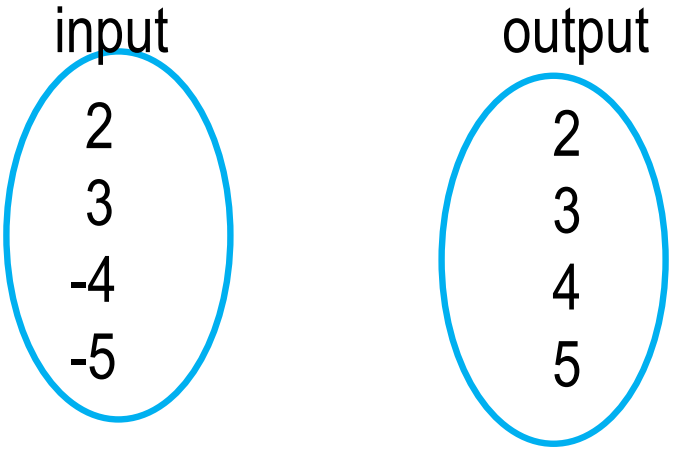


yes

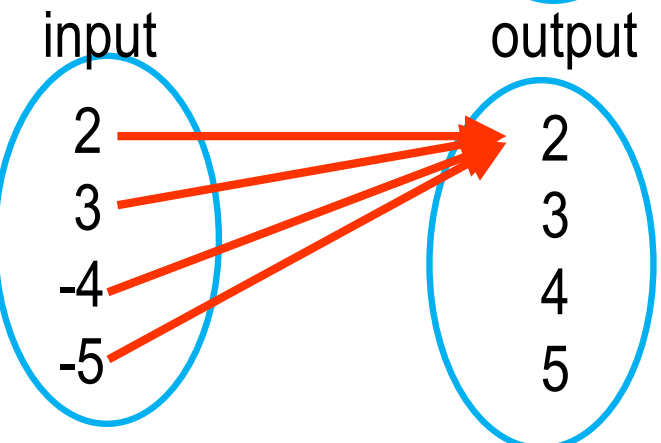
Is it a function?



No: input value '2' has more than one output



No (There aren't any pairings of inputs to outputs.)



Yes Each input has exactly one output (even though it's the same output)

Is it a relation?

There are at least 6 ways to show a relation between input and output values.

Ordered Pairs: (2, 4), (3, 2), (-4, 3)

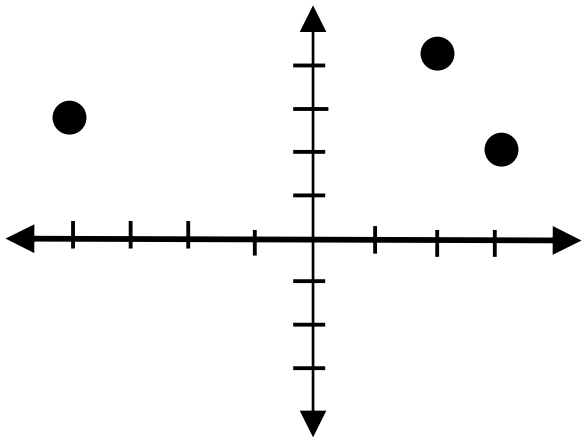
Data table:

x	2	3	-4
y	4	2	3

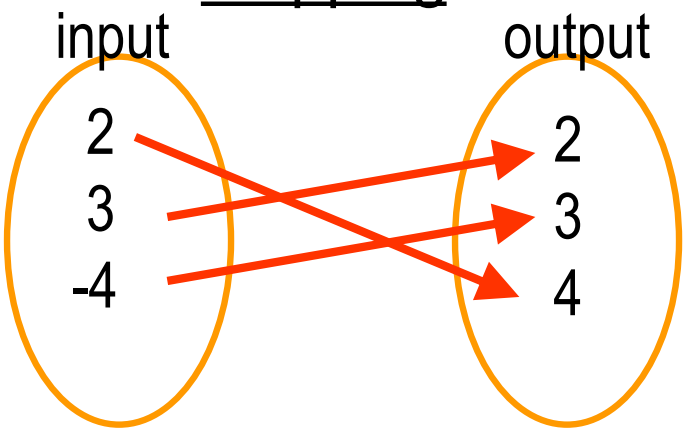
Equation: $y = 2x + 1$

Function notation: $f(2) = 4$

Graph:



Mapping



Are all of these representations the same?

Vocabulary

Domain: the set made up of all of the input values that have corresponding output values.

Range: the set made up of all of the corresponding output values.

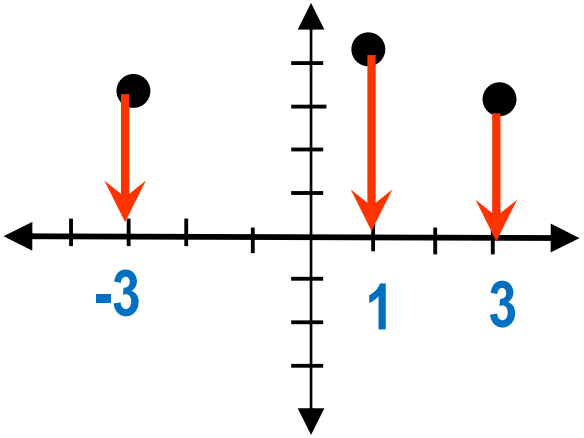
Identify the Domain

1. (2, 4), (3, 5), (-4, 2)

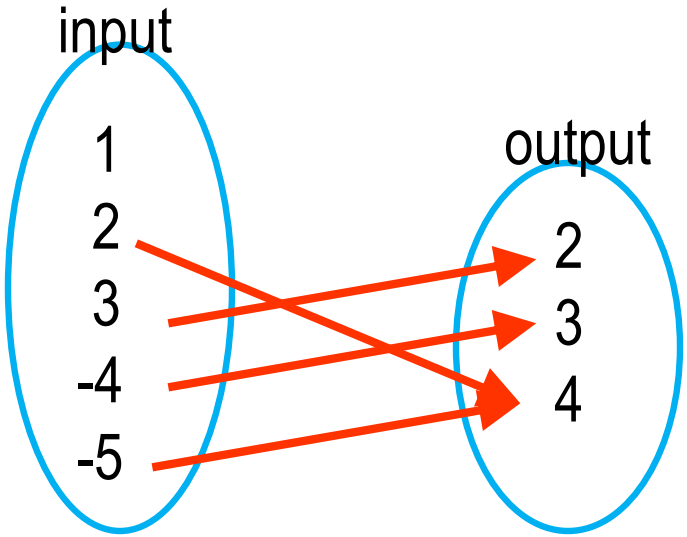
2.

x	6	9	-2
y	4	7	3

3.



4. **2, 3, -4, -5**



What are 6 ways you can show a relation between input and output ?

Ordered Pairs

Data table

Equation

Graph

Function notation: f(2) = 4

Mapping

$y = f(x)$ Function Notation

When we say “y is a function of x” we mean:

We are “doing math” (performing mathematical operations) on the input value ‘x’ to determine the corresponding output value ‘y’.

Which of the following equations is “ ’y’ a function of x”?

$$x = \frac{1}{2}y - 3$$

$$y = 2x + 6$$

Absolute Value Function

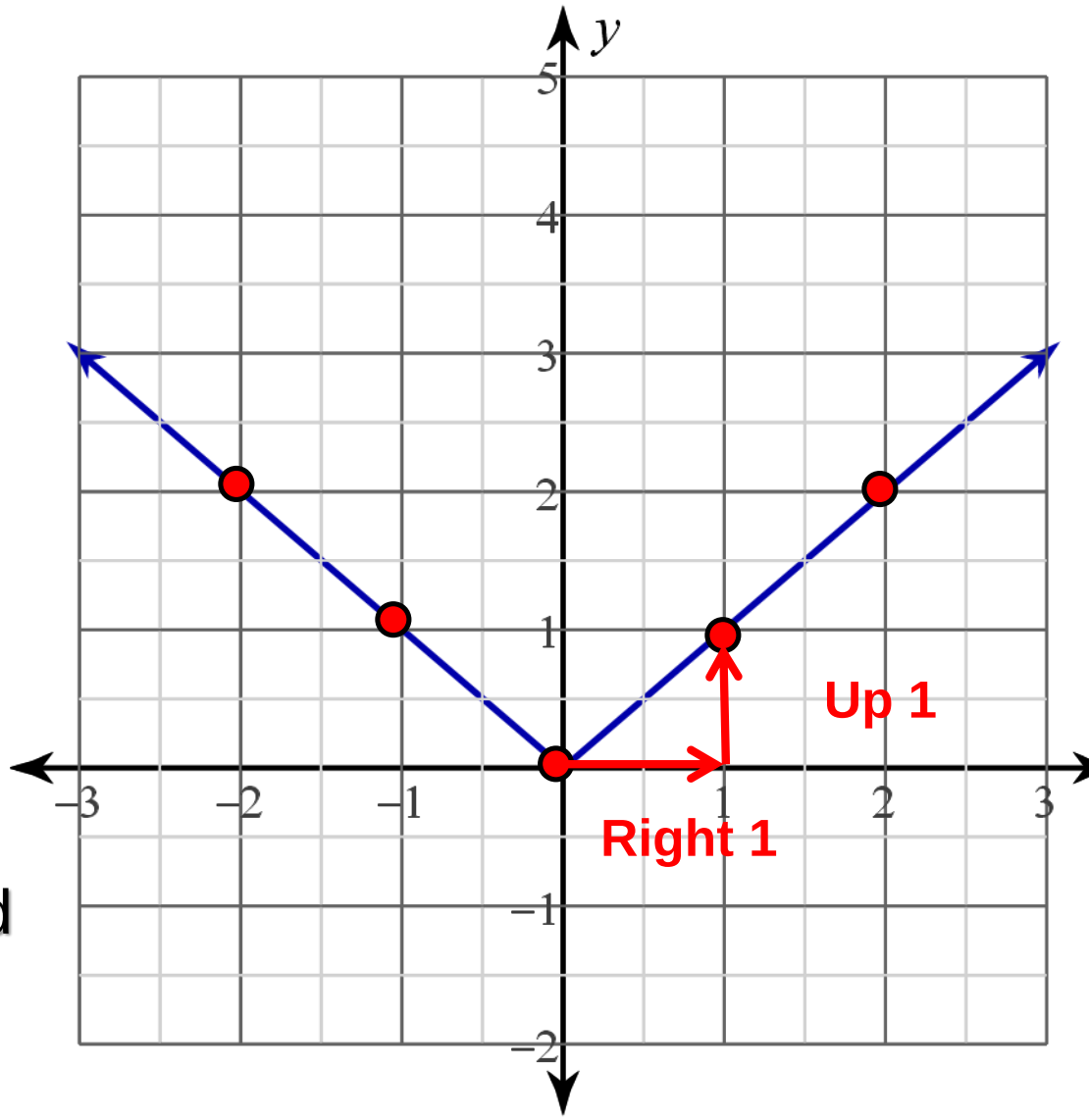
$$f(x) = |x|$$

Fill in the table, then graph the x-y pairs.

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

$$y = |-2|$$

$|-2|$ means "what is the distance between -2 and zero?



<u>Just like the Quadratic Function</u>, the point (0, 0) is the vertex and there is a point in the position "right 1, up 1" (from the vertex).

$f(x) = |x|$

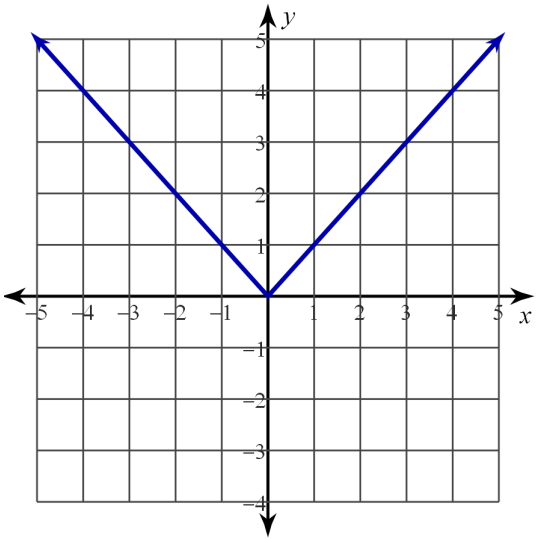
x	y
-2	2
-1	1
0	0
1	1
2	2

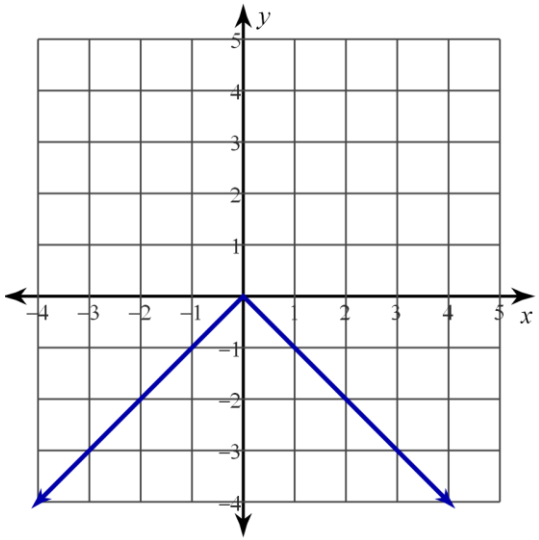
$g(x) = -|x|$

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?





$f(x) = |x|$

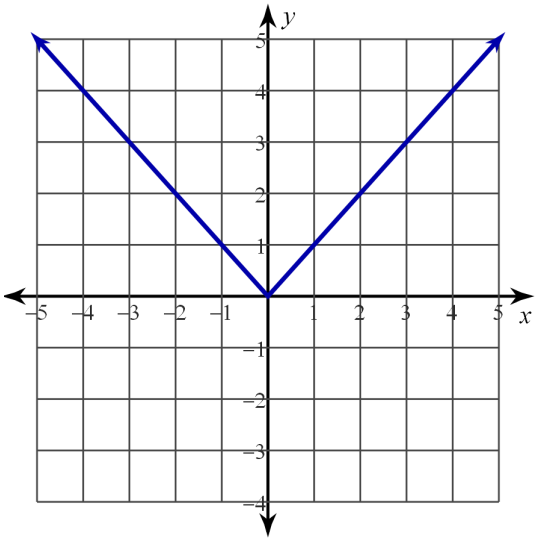
x	y
-2	2
-1	1
0	0
1	1
2	2

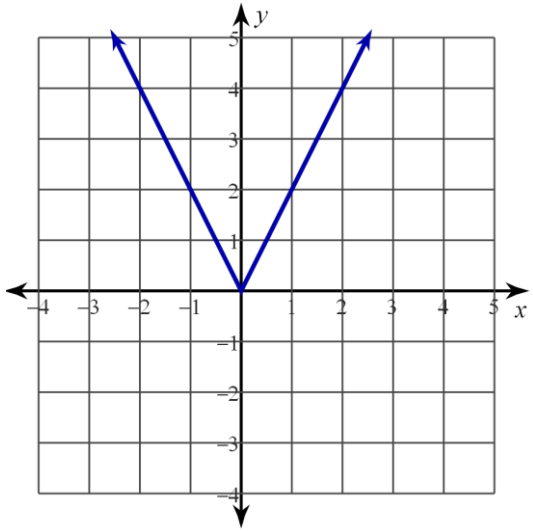
$g(x) = 2|x|$

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

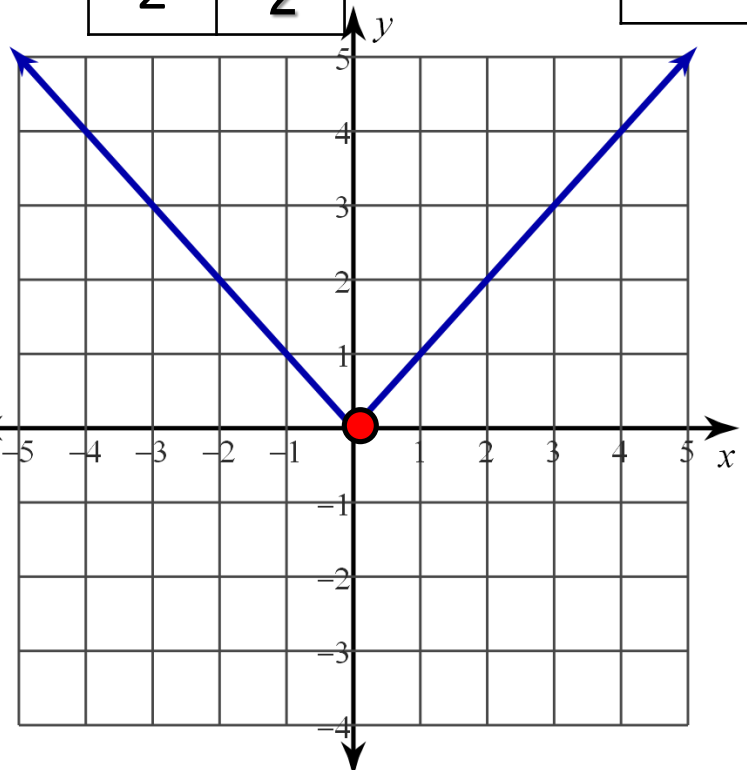
What is the vertex?





$f(x) = |x|$

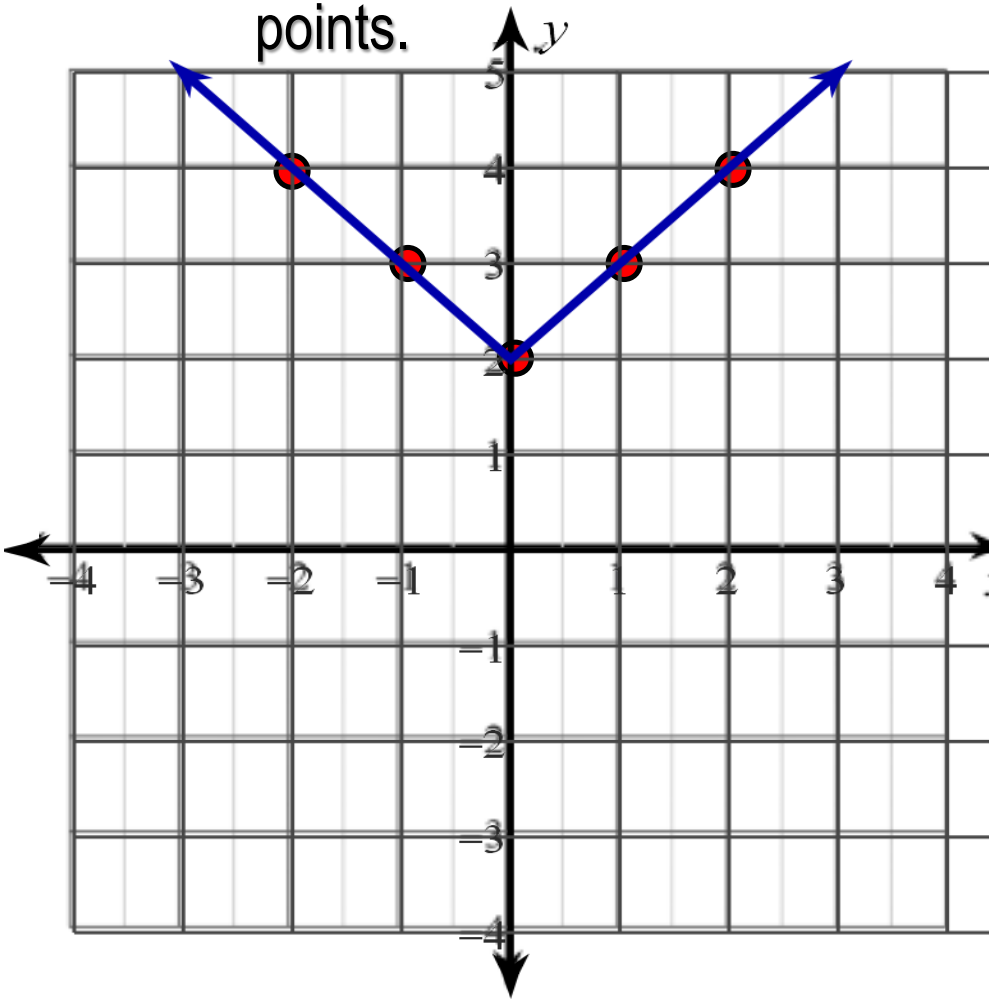
x	y
-2	2
-1	1
0	0
1	1
2	2



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

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

Fill in the table, graph the points.



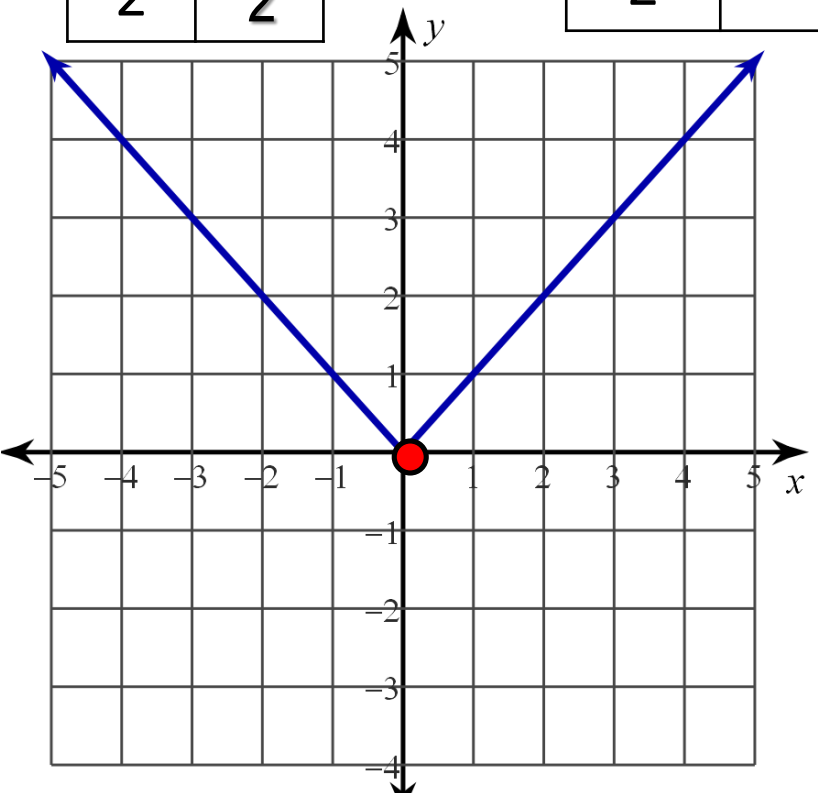
Adding 2 to the parent function causes the graph to translate ***up 2***

$f(x) = |x|$

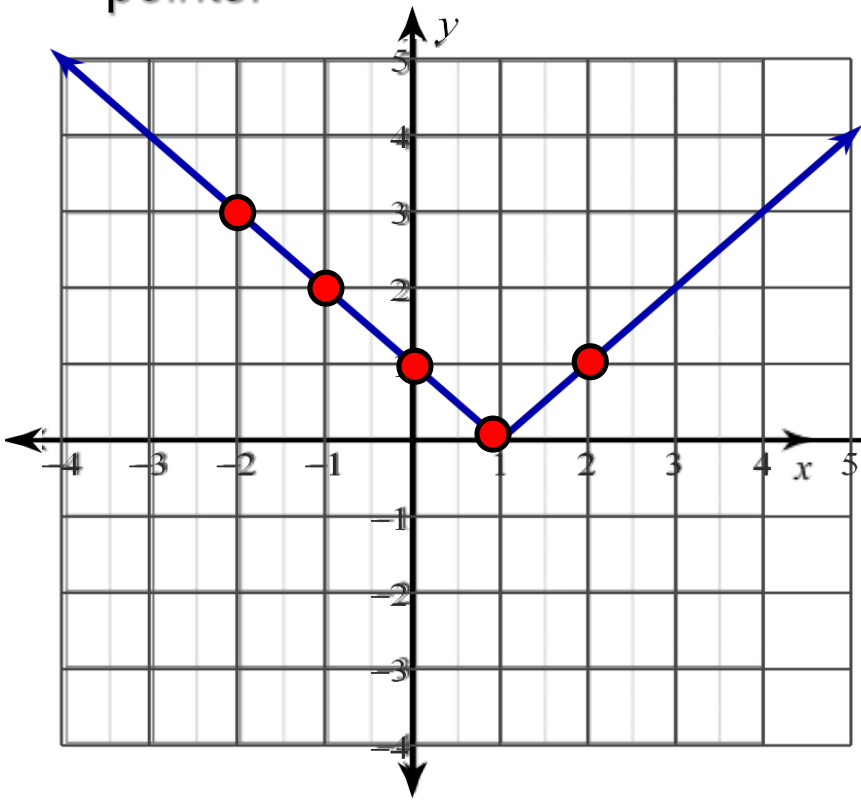
x	y
-2	2
-1	1
0	0
1	1
2	2

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

x	g(x)
-2	3
-1	2
0	1
1	0
2	1



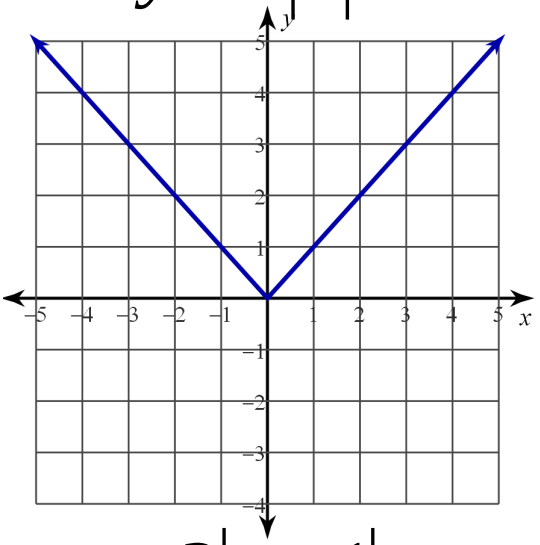
Fill in the table, graph the points.



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

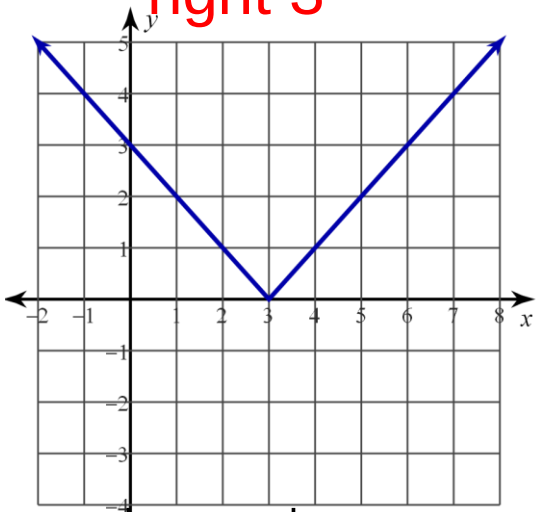
What is the transformation to the parent function?

$y = |x|$



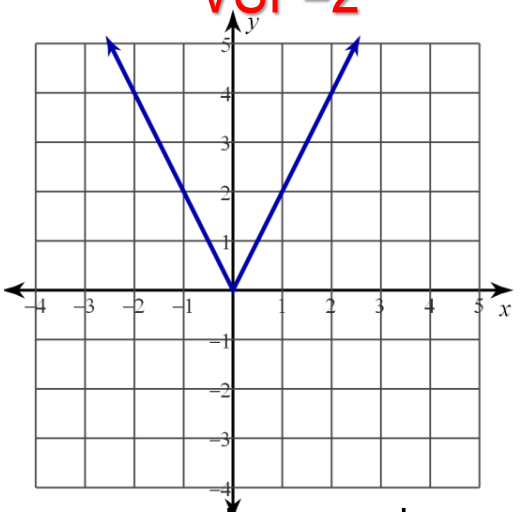
$y = |x - 3|$

right 3



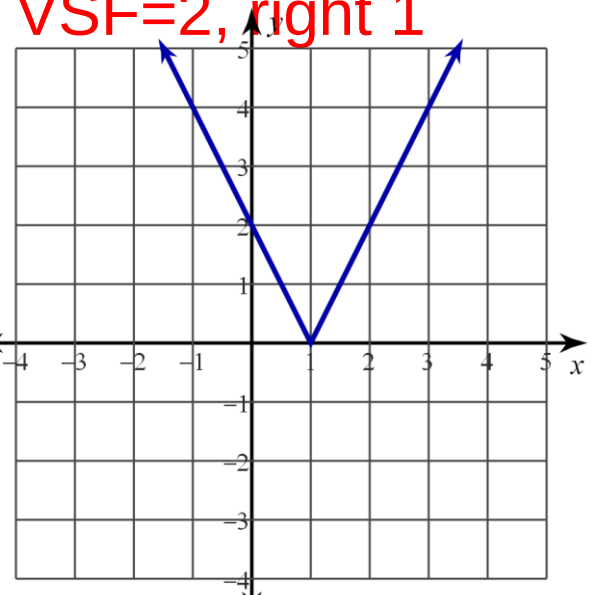
$y = 2|x|$

VSF=2



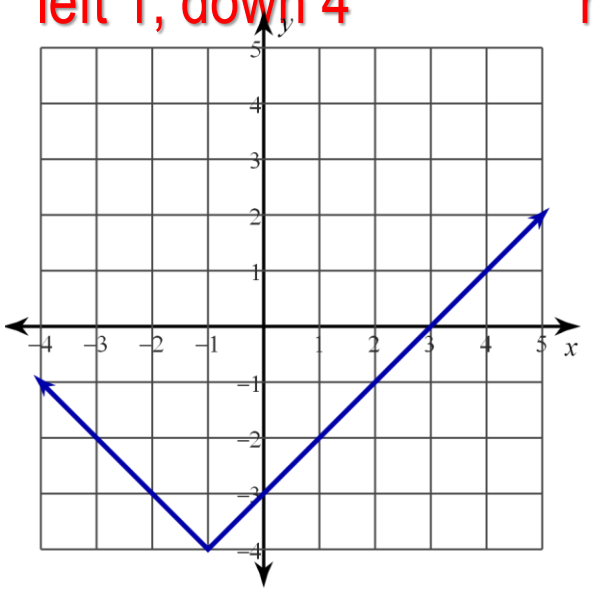
$y = 2|x - 1|$

VSF=2, right 1



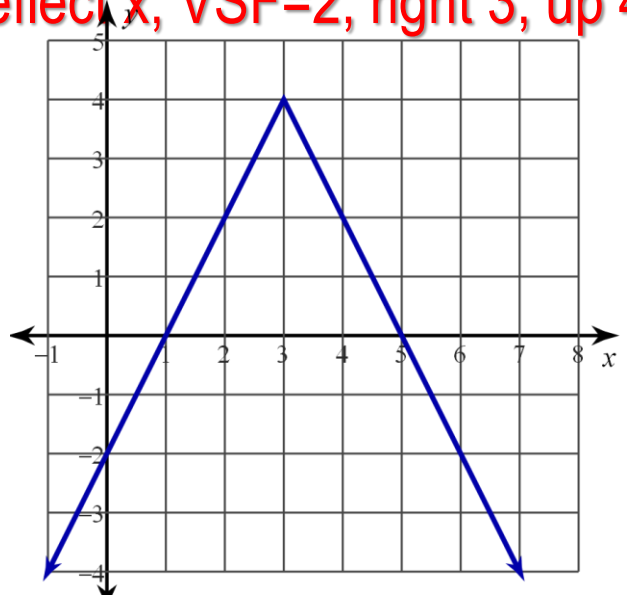
$y = |x + 1| - 4$

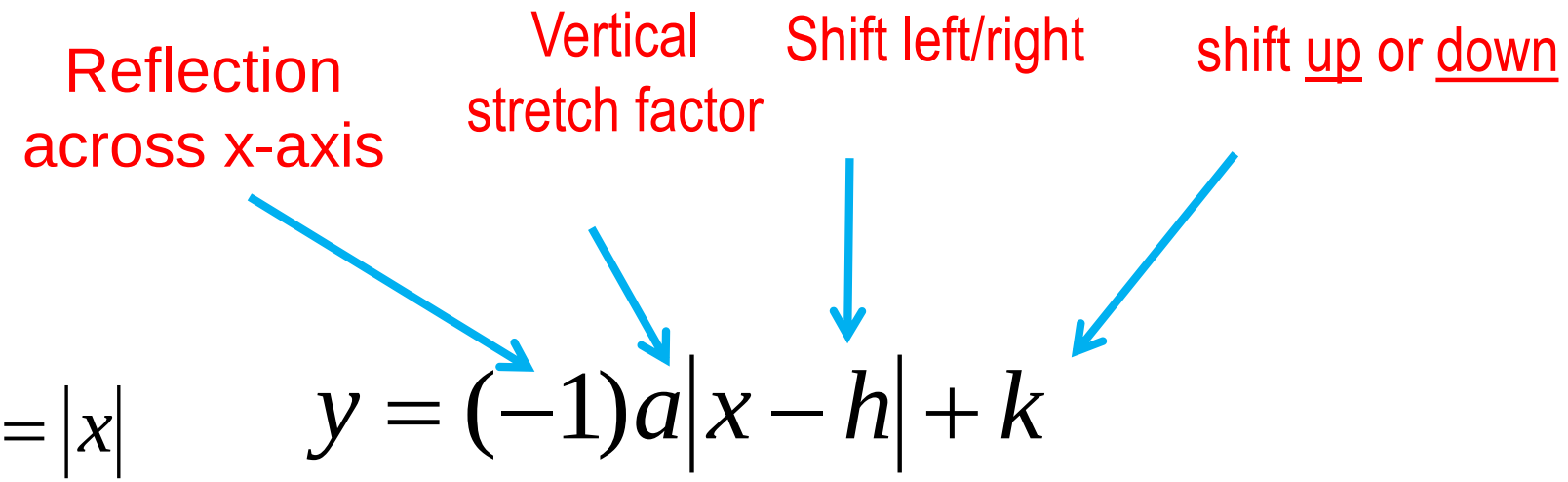
left 1, down 4



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

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





$y = 3(x+5)^2 - 2$

VSF=3,
left 5, down 2

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

reflected (x-axis)
VSF=5, right 2, up 3

What does adding or subtraction "k" do to the parent function?

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

What does adding or subtraction "h" do to the parent function?

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

What does multiplying by 'a' do to the parent function?

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

What does multiplying by (-1) do to the parent function?

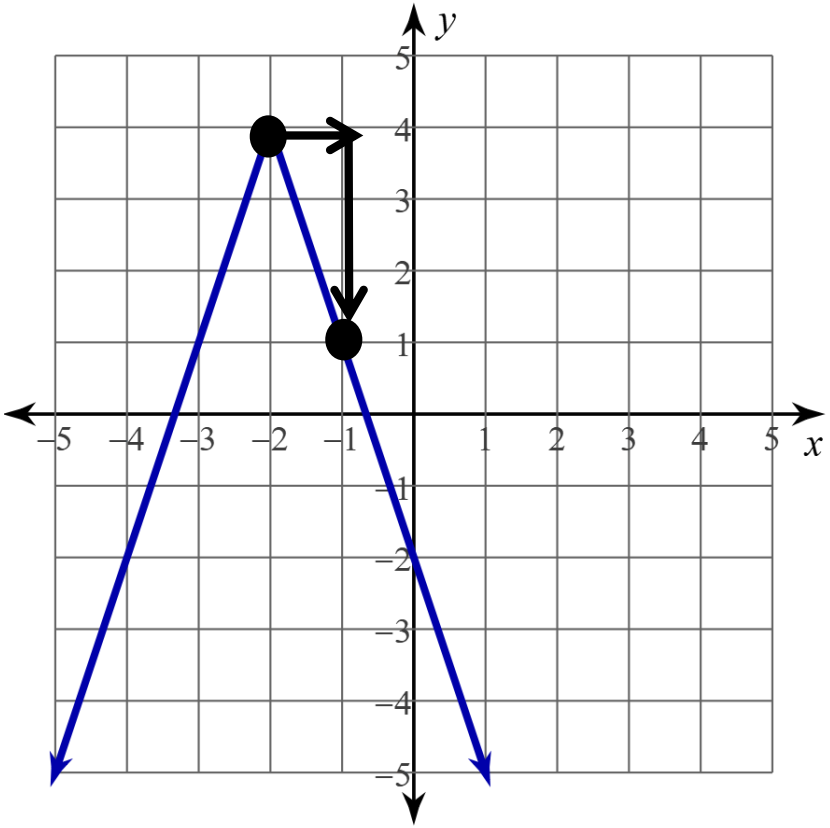
$$f(x) = -|x|$$ Reflection (x-axis)

What equation has been graphed? $f(x) = |x|$

1) Vertex has moved left 2 and up 4.

$g(x) = \_\_\_\_|x + 2| + 4$

2) Shape of the graph: *from the vertex* move right 1, down 3.



➔ Reflect x-axis, VSF=3.

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