

## Functions 4a - Absolute Value Functions

Standards: F-IF.7b

HW#1: Func 4a #1-6

Learning Target:

How do you graph an absolute value function?

## Absolute Value Functions

We now introduce a new basic type of function called the **absolute value function**. We have already seen the absolute value applied to a number. For example,  $|-3| = 3$ , while  $|5| = 5$ .

(erase to show)

The absolute value of a number is defined as its **distance from the number zero**. Therefore, the absolute value of a number is always **non-negative**. The absolute value of a function  $f$  is the function whose domain is the same as that of  $f$  and whose output at  $x$  is the absolute value of  $f(x)$ .

### Absolute Value Function

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

It's just like a quadratic in vertex form!

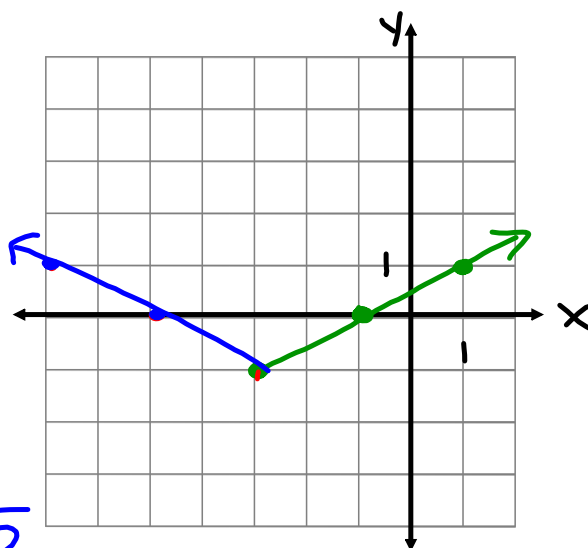
$$f(x) = a(x-h)^2 + k$$
$$2(x+7)^2 - 4$$

**Ex1: Graph**

$$f(x) = \frac{1}{2}|x+3| - 1$$

$$a = \frac{1}{2} \quad h = -3 \quad k = -1$$

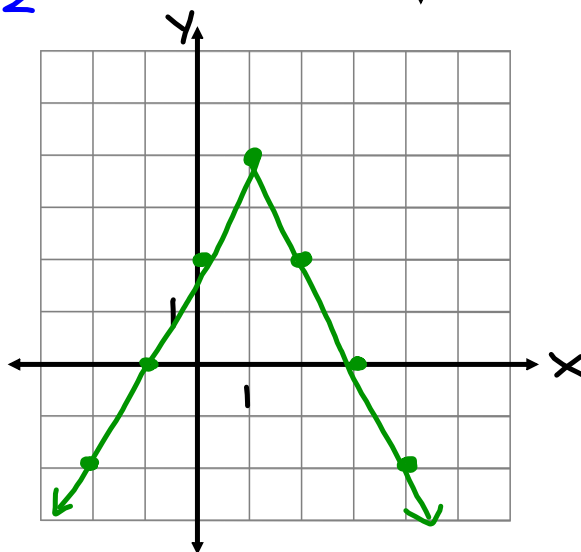
- cusp:  $(-3, -1)$
- concave up
- $m_R: \frac{1}{2} \rightarrow m_L: -\frac{1}{2} = -\frac{1}{2}$

**Ex2: Graph**

$$g(x) = -2|x-1| + 4$$

$$a = -2 \quad h = 1 \quad k = 4$$

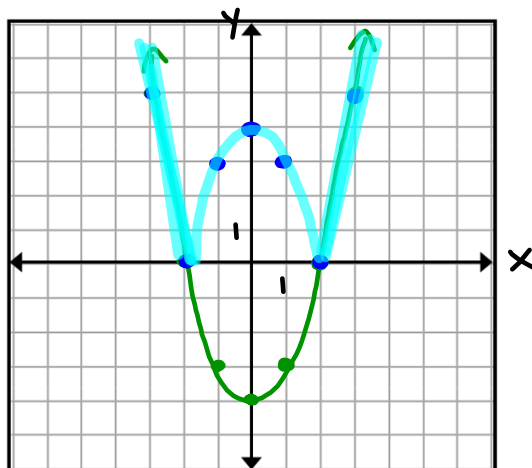
- cusp:  $(1, 4)$
- concave down
- $m_R: -2 = \frac{-2}{1}$



1. Fill in the following table of values for  $f(x)$  and its absolute value,  $g(x)$ .  $g(x) = |x^2 - 4|$

x	$f(x) = x^2 - 4$	$g(x) =  f(x) $
-3	5	5
-2	0	0
-1	-3	3
0	-4	4
1	-3	3
2	0	0
3	5	5

2. Graph  $f$ .

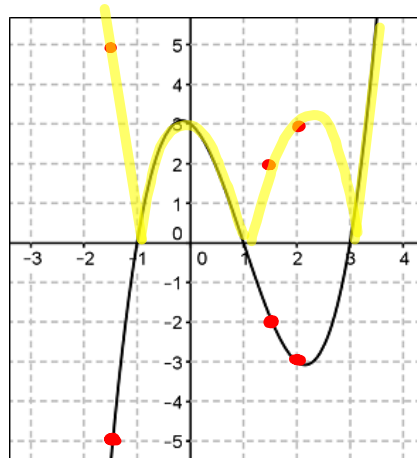


3. Transfer your graph of  $f$  to tracing paper. Fold the tracing paper along the  $x$ -axis. Place the folded tracing paper on the graph in such a manner that the  $x$ -axis on your graph matches the  $x$ -axis on the tracing paper (i.e. the bottom of your folded paper) and those points with positive values for  $f(x)$  coincide on both pieces of paper. You will notice that now all of your points have positive height. Is there a correlation between your resulting graph, which you can see through the tracing paper, and your table of values for  $g$ ?

4. Explain the relationship between the graph of a function and the graph of the absolute value of the same function.

- The points below x-axis reflected over the x-axis to make them positive.
- Parts of the graph have a similar shape.

5. Given the graph of  $f$  below, graph the absolute value of  $f$  on the same axis.



6. Use your graph of  $f(x) = |x^2 - 4|$  from problem 2 to approximate solutions to the following equations. Mark the point(s) on the graph of  $g$  that provide the solution to each equation. The  $x$ -coordinate(s) of these points will be your solutions. Note: each equation may or may not have more than one solution.

a)  $|x^2 - 4| = 0$   $x = -2 \text{ \& } 2$

b)  $|x^2 - 4| = 4$   $x = 0, -2.7, 2.7$

c)  $|x^2 - 4| = 3$   $x = 1, -1, -2.4, 2.4$

