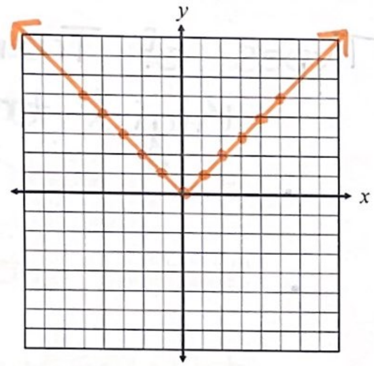
TRANSFORMATIONS

A transformation changes the position or size of a figure. Transformations can be applied to parent functions.

Use the absolute value function as an example.

Parent Function:

$f(x)=|x|$



Using your calculator, graph the following functions, then compare to the parent function. Give a brief description.

1. $f(x)=\|x+2\|$ The graph is shifted 2 units left	**2.** $f(x)=\|x-2\|$ shifted to the right
3. $f(x)=\|x\|+2$ shifted 2 units up	**4.** $f(x)=\|x\|-2$ shifted 2 units down
5. $f(x)=2\|x\|$ stretched by factor of 2	**6.** $f(x)=\frac{1}{2}\|x\|$ compressed by factor of $\frac{1}{2}$
7. $f(x)=-\|x\|$ reflected over the x-axis	

TRANSFORMATIONS *Guide*

Any type of function f(x)

Translations of f(x)	
$f(x+h)$	slides h units left.
$f(x-h)$	slides h units right.
$f(x)+k$	slides K units up
$f(x)-k$	slides K units down

Dilations		
$a \cdot f(x)$	when $\|a\|>1$	stretches vertically
$a \cdot f(x)$	when $\|a\|<1$	compress vertically

Reflections	
$-f(x)$	reflects over x-axis

Describe the transformation

$f(x) = |x| + 9$

$h = 0$ ← no # inside grouping
$K = 9$

The graph moves up 9 units

$f(x) = |x - 5| + 0$ ← K

$h = 5$
$K = 0$

The graph moves right 5 units

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

$h = 0$
$K = -2$
$a = 3$

The graph moves three units <u>down</u> and is <u>stretched</u> by a factor of 3.

$f(x) = \frac{1}{4}|x + 6|$

$|x - (-6)|$

$h = -6$
$K = 0$
$a = \frac{1}{4}$

The graph moves left 6 units <u>and</u> is <u>compressed</u> by a factor of $\frac{1}{4}$.

Graphing form $f(x) = a|x - h| + K$

Types of Transformations

Rigid transformation

- Rotation
- Reflection
- translation

not rigid transformations

- dilation

Name:	Date:	Period:

3.2 Transformations Notes

Warm Up

1. What is the parent function of an absolute value function?

   $f(x) = |x|$

Vertex Form of an Absolute Value Function

The **vertex form/graphing form** of an **absolute value function** is written as: $f(x) = a|x-h| + k$

Where (h, k) is the **vertex**, a is the stretch factor

On an absolute value, a is the **slope on the right side** and $-a$ is the **slope on the left side**

ONLY

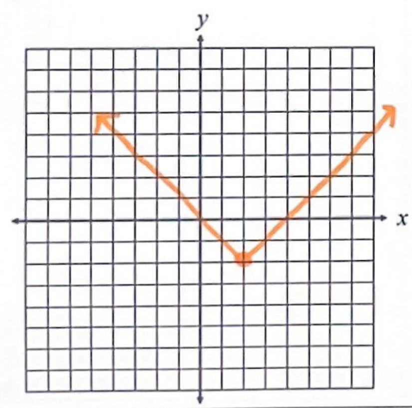
Directions: Give the vertex of each function or inequality. Then, graph.

Ex1: $f(x) = |x-2| - 2$

a, h, $+^-2$, k

vertex $(2,-2)$

$a=1$



1. Plot vertex.
2. From vertex (pretend it is origin) plot parent if $a=1$

Ex2: $f(x) = 3|x+5| + 0$

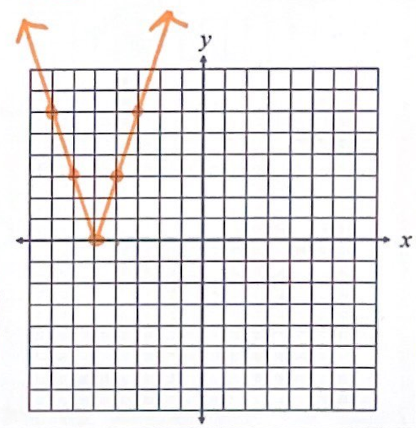
a, $h=-5$, k

$(-5,0)$ vertex

$a=3$

$y=|x|$

x	y	
-2	2	
-1	1	
0	0	0
1	1	3
2	2	6



1. plot vertex
2. Plot parent points as if it is the origin. $a=1$
3. If it has a "stretch factor", multiply output by it.
4. Reflect points.

Ex3: $f(x) = -|x-6| + 0$

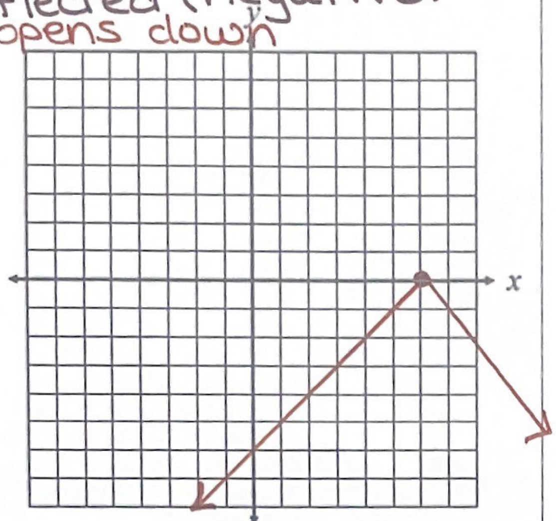
$\uparrow h$ $\uparrow k$

vertex (6,0)

a = 1

reflected (negative)

opens down

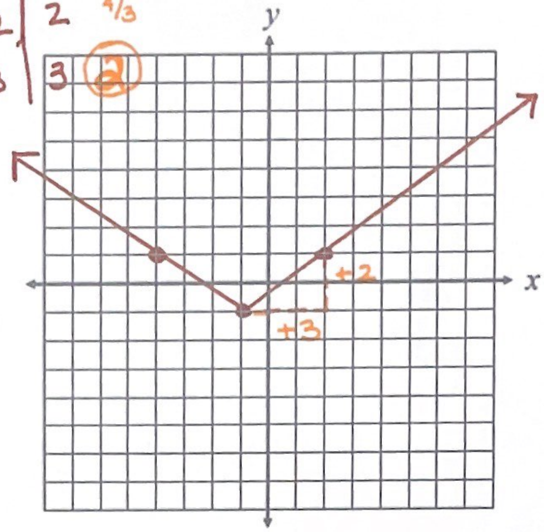


Ex4: $f(x) = \frac{2}{3}|x+1| - 1$

vertex (-1, -1)

$a = \frac{2}{3}$

x	y	2/3 of y
0	0	
1	1	2/3
2	2	4/3
3	3	2



Ex5: $y < |x+4| - 6$

dashed

vertex (-4, -6)

a = 1

Test (0,0)

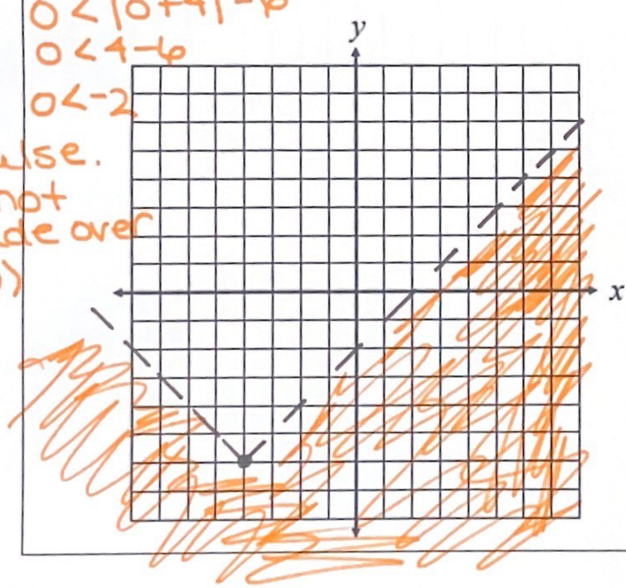
$0 < |0+4| - 6$

$0 < 4 - 6$

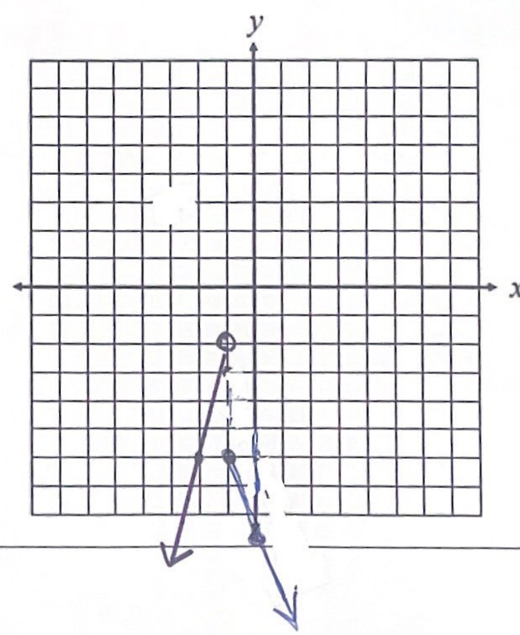
$0 < -2$

false.

Do not shade over (0,0)



Ex6: $f(x) = \begin{cases} 4x + 2; & \text{if } x < -1 \\ -3|x+3|; & \text{if } x \geq -1 \end{cases}$



Algebra 2