Goal: Students can graph absolute value functions, and perform transformations on them in the coordinate plane.

General Form of an Absolute Value Function: (Vertex form)

variable/input

variable output → $y = a|x - h| + K$ ← vertical shift

"rate of change" dilation

horizontal shift (opp)

+a = ↗↖

−a = ↙↘

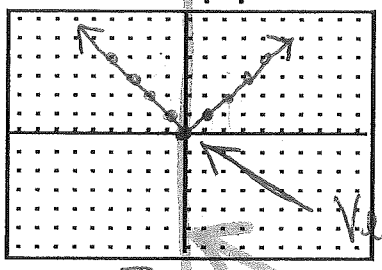
B. Explain your knowledge about **absolute value** using words.

Always positive, and it tells you the distance a point is from zero.

C. Using past knowledge to create new knowledge, try graphing the following function:

a = 1

4. $y = |x|$



Vertex (0,0)

Domain: ℝ

Range: $y \geq 0$

~~Explain your reasoning for the graph you created.~~

Vertex: highest or lowest point on the graph (AV + Quadratics)

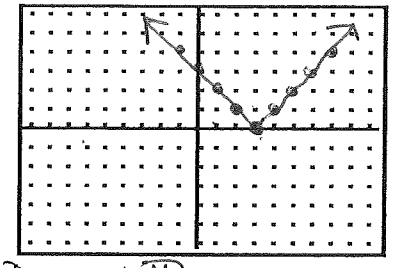
~~Please justify this method (using another method).~~

line of symmetry ALWAYS passes thru vertex.

Now try graphing the following absolute value equations. Create your own table to justify values.

a = 1

5. $f(x) = |x - 3|$ ↔ opp



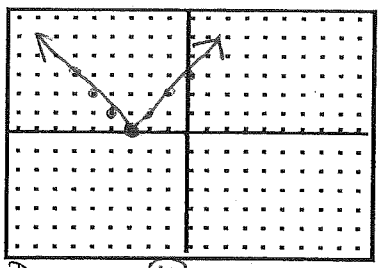
Vertex (3,0)

x	f(x)
3	0
2	1

Domain: ℝ

Range: $y \geq 0$

6. $g(x) = |x + 3|$ opp a = 1



x	g(x)

Domain: ℝ

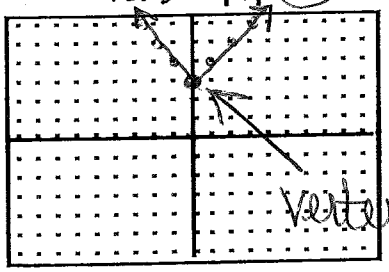
Range: $y \geq 0$

D. Compare the graphs for problem 4, 5, and 6. Make a conjecture about functions that come in the form: $y = |x - h|$.

h is telling you the horizontal shift (opp)

E. Use a table to create the following graph.

10. $y=|x|+3$ ↕ $a=1$



x	y
0	3

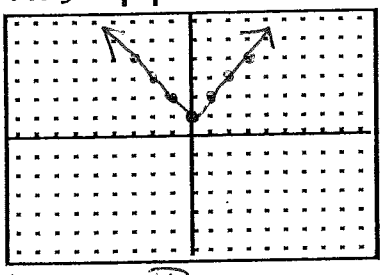
Domain: $\mathbb{R}$

Range: $y \geq 3$

Explain the difference between this graph and the graph of $y=|x|$.

Now try graphing the following absolute value equations. Create a table to justify values.

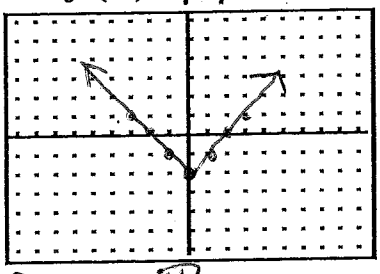
11. $y=|x|+1$ $a=1$



Domain: $\mathbb{R}$

Range: $y \geq 1$

12. $f(x)=|x|-2$ $a=1$



Domain: $\mathbb{R}$

Range: $y \geq -2$

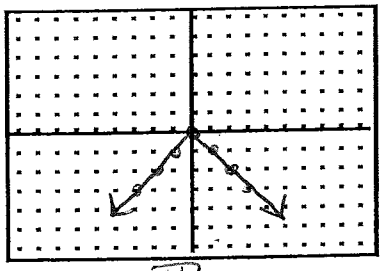
F. Make a conjecture about functions that come in the form: $y=|x|+k$.

K tells the vertical shift

G. Vertical reflection

Use a table to create the following graph:

13. $y=-|x|$ $a=-1$



x	y

Domain: $\mathbb{R}$

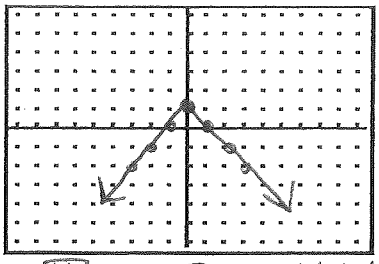
Range: $y \leq 0$

Explain the difference between this graph and the graph of $y=|x|$.

Now try graphing the following absolute value equations. Create a table to justify values.

$a = -1$

14. $y = -|x| + 1$

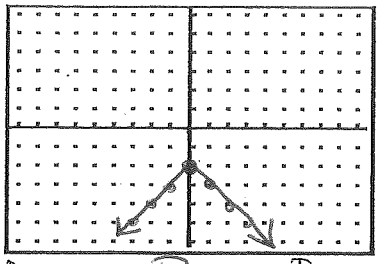


Vertex (0,1)

Domain: $\mathbb{R}$ Range: $y \leq 1$

$a = -1$

15. $f(x) = -|x| - 2$



Vertex (0,-2)

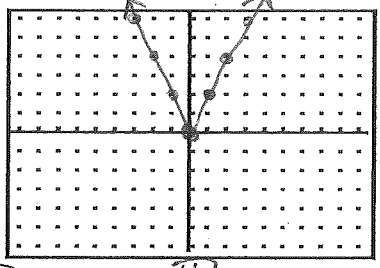
Domain: $\mathbb{R}$ Range: $y \leq -2$

Explain what happens to the graph if the absolute value is multiplied by a negative.

H. Vertical stretch – now we're going to get tricky!

Graph the following:

16. $y = 2|x|$ $a = 2$ up 2, out 1



x	y

Domain: $\mathbb{R}$

Range: $y \geq 0$

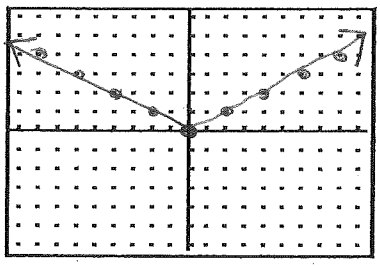
Explain the difference between this graph and the graph of $y = |x|$.

$|a| > 1$ graph is vertically stretched (skinny)

$|a| < 1$ (fraction) graph is vertically compressed (wider)

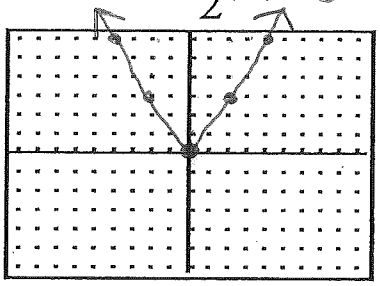
Now try graphing the following absolute value equations.

17. $y = \frac{1}{2}|x|$ $a = \frac{1}{2}$



Vertex (0,0)

18. $f(x) = \frac{3}{2}|x|$ $a = \frac{3}{2} = 1.5$



What is the effect on the graph of multiplying the absolute value function by a number?

Vertically stretched or compressed

$y = a|x - h| + k$ (opp)

$y = |x - 4| + 2$ (opp)

Vertex: (4, 2)

Name:

Graphing Absolute Value Functions

1. $f(x)=2|x+3|-2$

$a=$

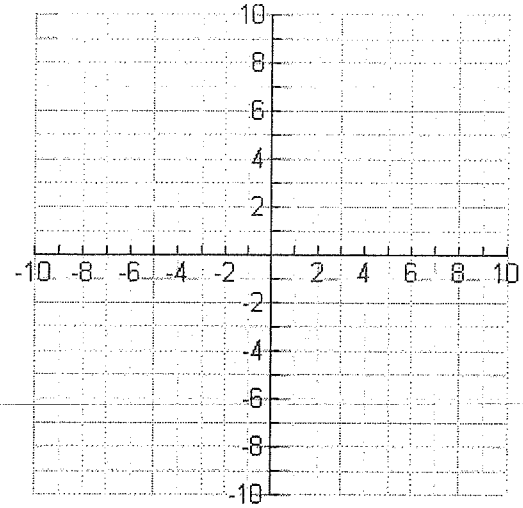
$h=$

$k=$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



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

$a=$

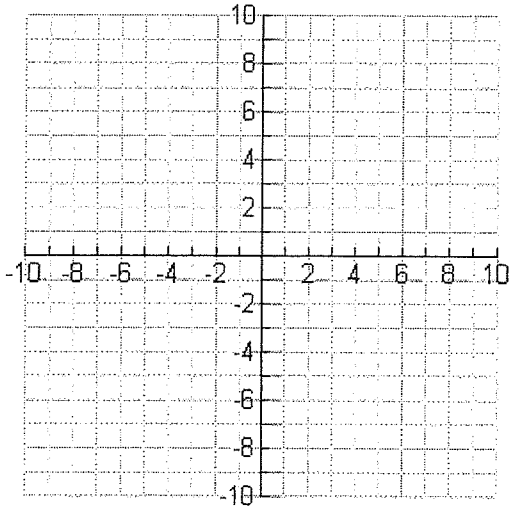
$h=$

$k=$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



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

$a =$

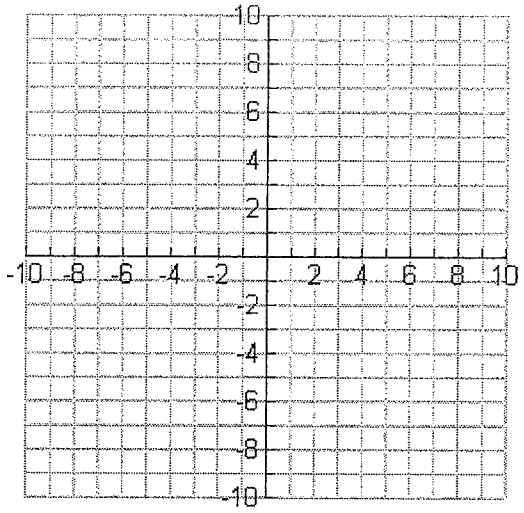
$h =$

$k =$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



4. $f(x) = \frac{1}{2}|x| - 2$

$a =$

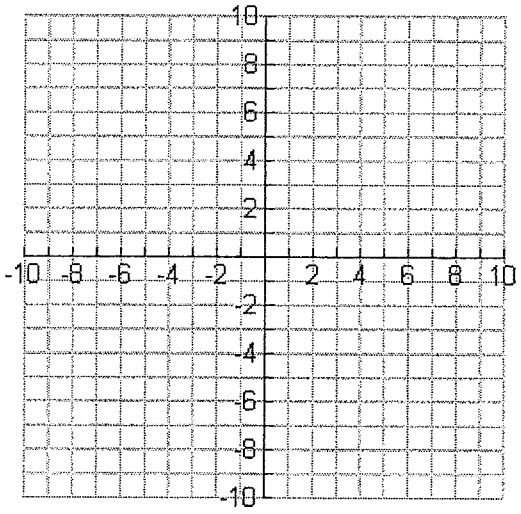
$h =$

$k =$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



5. $f(x)=\frac{1}{4}|x-1|-3$

$a=$

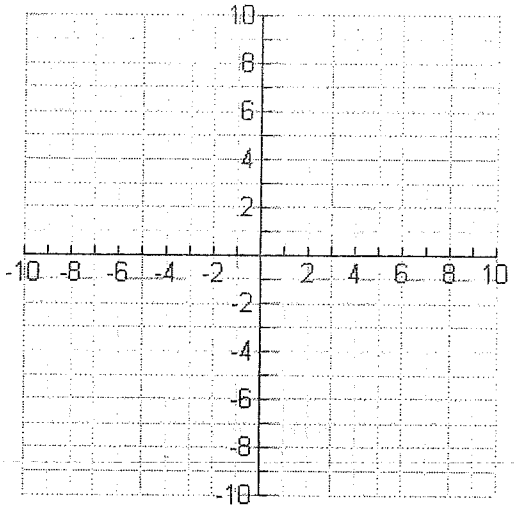
$h=$

$k=$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



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

$a=$

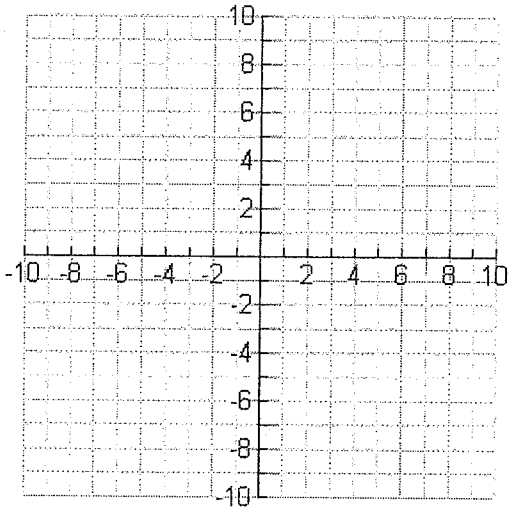
$h=$

$k=$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



7. $f(x)=|x+3|-2$

$a=$

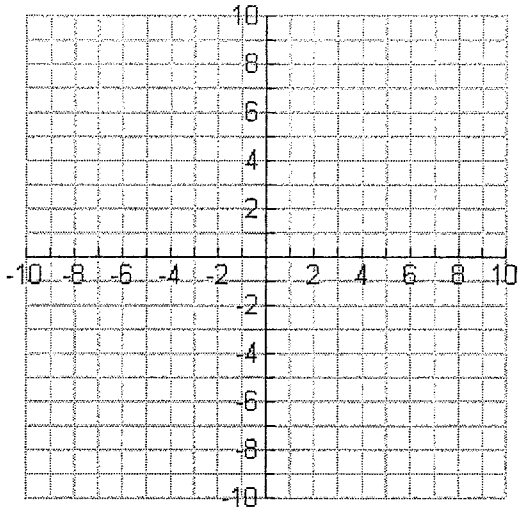
$h=$

$k=$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



8. $f(x)=\frac{4}{3}|x+2|-4$

$a=$

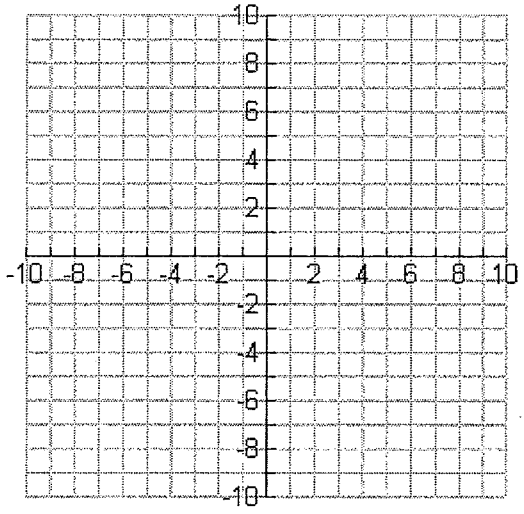
$h=$

$k=$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



9. $f(x) = -\frac{1}{2}|x-1|+5$

$a =$

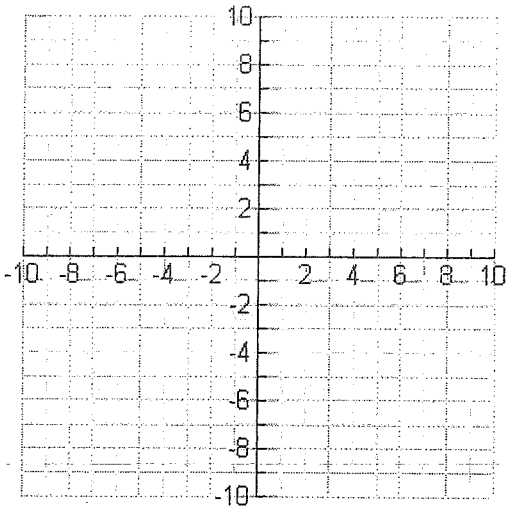
$h =$

$k =$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



10. $f(x) = \frac{1}{3}|x-3|-6$

$a =$

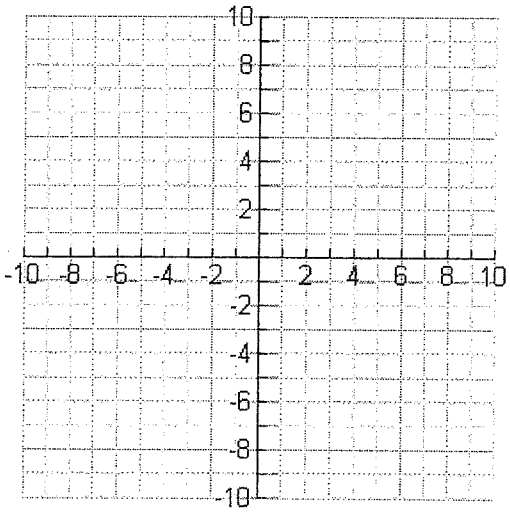
$h =$

$k =$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



11. $f(x) = -2|x-3|-4$

$a =$

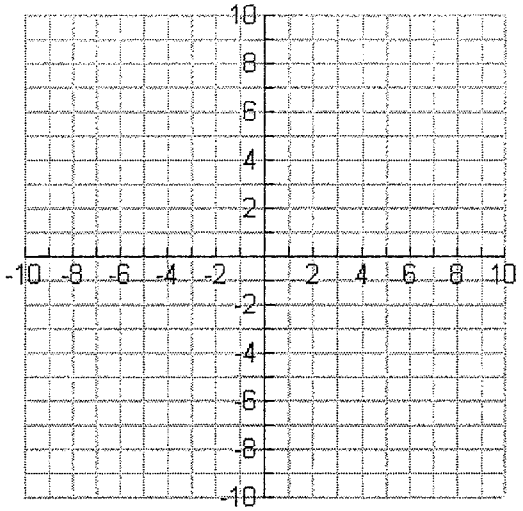
$h =$

$k =$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.



12. $f(x) = -4|x-2|+8$

$a =$

$h =$

$k =$

Direction of Opening

Coordinates of the Vertex

Using words describe the transformation.