Graph of $y = a|x - h| + k$

The graph of the Absolute Value Functions we will be studying will always be a "V"-shape

a:
- Vertical stretch or shrink factor (slope of sides).
- If $a<0$, x-axis reflection (upside down)

h:
- Horizontal translation
- x-h h units right
- x+h h units left

k:
- Vertical translation
- +k k units up
- -k k units down

Describe the transformations of the Parent Function $y=|x|$ this equation represents:

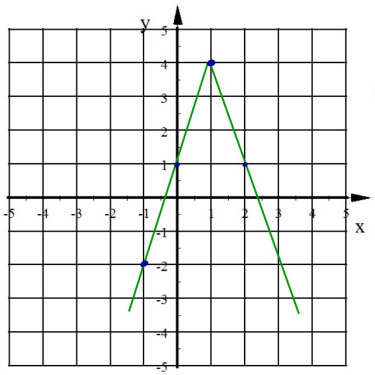
$y = -6|x + 7| - 10$

- 6 times as tall
- 7 units left
- 10 units down
- Opens down

Write the equation of the parent function $y=|x|$ after the following transformations:

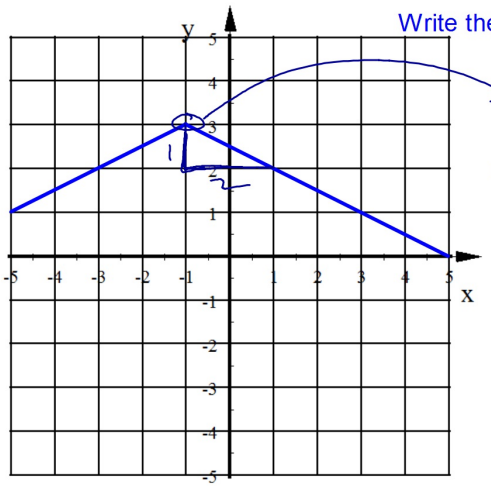
- Vertical shrink to one-fourth the height
- Translate 13 units right
- Translate 2 units up
- Opens Up.

$y = \frac{1}{4}|x-13|+2$



Graph $y = -3|x-1| + 4$

This equation tells us that the graph has
moved 1 unit right } Vertex is (1,4)
moved 4 units up }
Opens Down Coefficient is Negative
Sides have a slope of ±3
Vertical Stretch Factor of 3



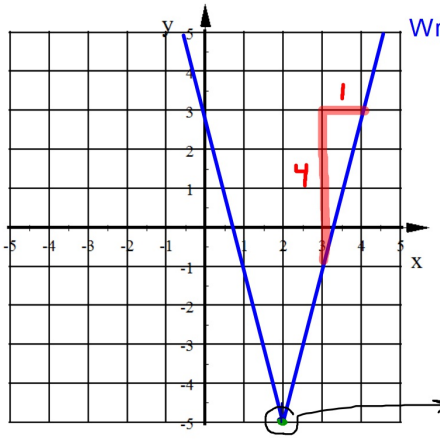
Write the equation of this graph.

Vertex of (-1,3) shows the graph moved
1 left & 3up

The graph opens down

Since the sides have a slope of ± 1/2 there is a vertical shrink factor of 1/2

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

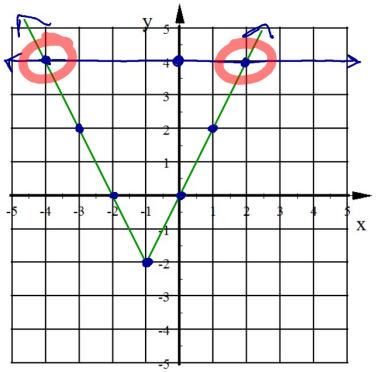


Write the equation of this graph.

$$y = 4|x-2|-5$$

Since the V opens up the coefficient stays positive.

2 right & 5 down



1. Graph $y = 2|x + 1| - 2$

2. Graph $y = 4$

3. What part of this graph shows the solution to this equation:

$$2|x + 1| - 2 = 4$$

where the graphs intersect

Therefore, the solutions are the x-coordinates of the points of intersection.

Solutions: $x = -4, 2$

Solve Algebraically: $2|x + 1| - 2 = 4$

Step #1 EVERY TIME: Isolate the absoltue value on one side of the equation

$$2|x + 1| - 2 = 4$$

$$+2 \quad +2$$

$$\frac{2|x+1|}{2} = \frac{6}{2}$$

$$|x+1| = 3$$

Solve Algebraically: $2|x + 1| - 2 = 4$

Once you've isolated the Absolute Value → $|x + 1| = 3$

Definition — **Algebraic Definition of Absolute Value**

- If $x \geq 0$, then $|x| = x$.
- If $x < 0$, then $|x| = -x$.

You could also remember that Absolute Value is defined as Distance from zero on a number line. You could be on both sides of zero (pos and neg) yet be the same distance away.

$|x + 1| = 3$

Therefore:

$x + 1 = 3$ (−1 −1) or $x + 1 = -3$ (−1 −1)

$x = 2$ or -4

Solve this equation: $5|2x - 3| + 7 = 31$

$-7 \quad -7$

$\frac{5|2x-3|}{5} = \frac{24}{5}$

$|2x - 3| = 4.8$

$2x - 3 = -4.8$ (+3 +3)

$\frac{2x}{2} = \frac{-1.8}{2}$

$x = -.9$

$2x - 3 = 4.8$ (+3 +3)

$\frac{2x}{2} = \frac{7.8}{2}$

$x = 3.9$

$x = -.9, 3.9$

Solve this equation: $2|x + 8| + 25 = 17$

$-25 \quad -25$

$\frac{2|x+8|}{2} = \frac{-8}{2}$

$|x + 8| = -4$

At this point you should realize that the absolute value of a quantity can't equal -4 → NO SOL