Yesterday we explored what the graph of $Y = a|x|$ looks like for different values of a.

$a > 0 \rightarrow$ V-shape opens up $\quad a < 0 \rightarrow$ V-shape opens down

When $a > 1$ it is called a vertical stretch factor and the graph is taller.

When $0 < a < 1$ it is called a vertical shrink factor and the graph is shorter.

Step 1 Graph $Y_2 = |x + h|$ or $Y_2 = |x - h|$ by using different values for h. Describe how different values of h affect the graph.

y = |x + 5|

Graph translates
5 units LEFT

Vertex will be (-5,)

y = |x - 3|

Graph translates
3 units RIGHT

Vertex will be (3,)

y = |x - h|

The x-coordinate of the vertex is h

Step 2 Graph $Y_2 = |x| + k$ or $Y_2 = |x| - k$ by using different values for k. Describe how different values of k affect the graph.

y = |x| + 7

Graph translates
7 units UP

Vertex will be (, 7)

y = |x| - 1

Graph translates
1 unit DOWN

Vertex will be (, -1)

y = |x| + k

The y-coordinate of the vertex is k

Describe the tranformation of the parent function
Y = |X| and state the coordinates of the vertex.

1. y = |x + 11| - 8

11 left and 8 down

(-11, -8)

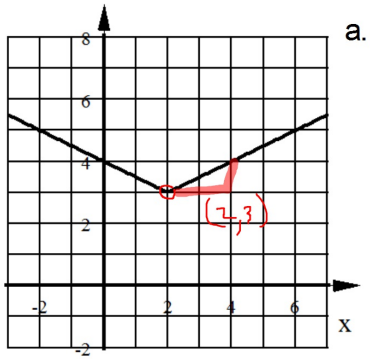
2. y = |x - 20| + 13

20 right and 13 up

(20,13)

In general, given y = |x - h| + k,
the coordinates of the vertex are

(h, k)

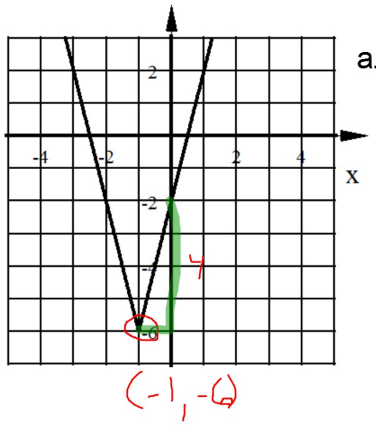


a. Describe the transformation

- 2 right, 3 up, 1/2 as tall

b. Write the equation

y = 1/2 |x - 2| + 3



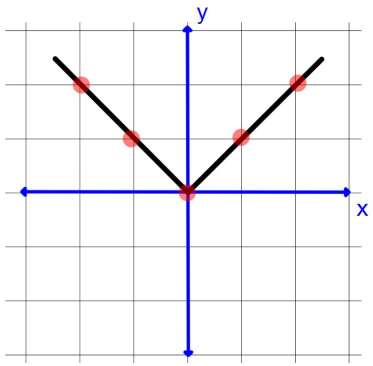
a. Describe the transformation

- 1 left, 6 down, 4x as tall.

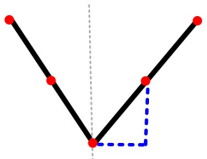
b. Write the equation

y = 4 |x + 1| - 6

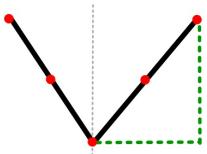
The parent Absolute Value function: y = |x|



The parent Absolute Value function: $y = |x|$



From the vertex the first "good" point is 1 right and 1 up



From the vertex the secnod "good" point is 2 right and 2 up

You can then use the Line of Symmetry to find points on the other side.

Using graph paper not a graphing calculator do the following for each Absolute Value function:

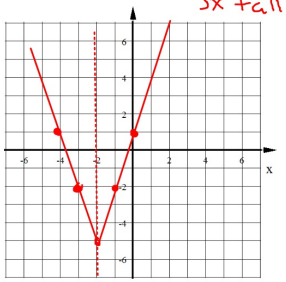
a. Describe the transformation each equation represents.

b. Graph using at least 5 points.

1. $y = 3|x + 2| - 5$

2 left 5 down

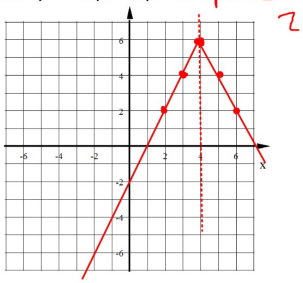
3x taller



2. $y = -2|x - 4| + 6$

4RT, Comp, upside down

2x taller

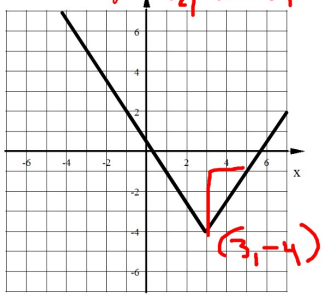


Do the following for each graph:

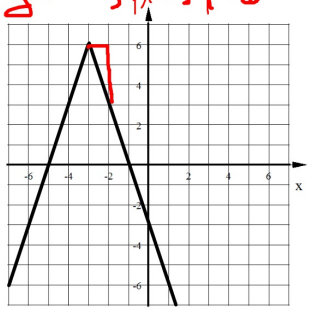
a. Describe the transformation each equation represents. ✓

b. Write the equation of each.

1. $y = \frac{3}{2}|x - 3| - 4$



2. $y = -3|x + 3| + 6$



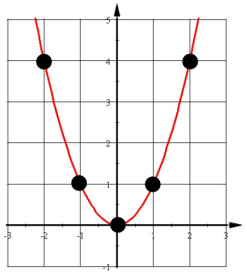
In general, if the function $y = f(x)$ is transformed the following way:

$$y = a\, f(x - h) + k$$

The parent function has been:

- Streched/Shrunk vertically by a factor of a
- Reflected over x-axis if $a<0$
- Translated horizontally h units.
- Translated vertically k units.

Parent Quadratic Function: $y = x^2$



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

Vertex: (0,0)

Line of Symmetry: x=0

First "good" from vertex:
1 right, 1 up

Second "good" point from vertex:
2 right, 4 up