GRAPHING ABSOLUTE VALUES

It's time to do more graphing — of course, this time there will be absolute values in the formula.

EXAMPLE 1: **Graph:** $y = |x|$

Solution: Pick some x-values, calculate the corresponding y-values, and plot the points:

$x = -2 \Rightarrow y = |-2| = 2 \Rightarrow$ **(–2, 2)**

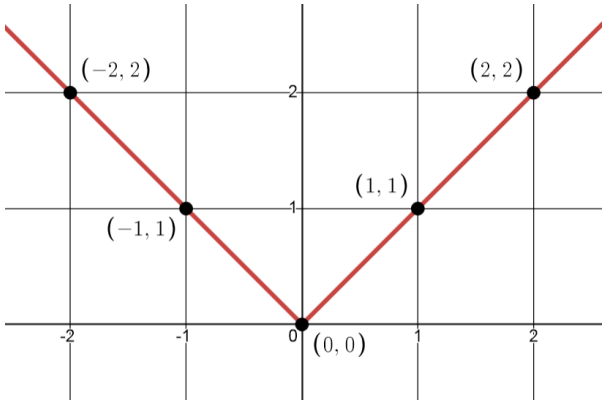
$x = -1 \Rightarrow y = |-1| = 1 \Rightarrow$ **(–1, 1)**

$x = 0 \Rightarrow y = |0| = 0 \Rightarrow$ **(0, 0)**

$x = 1 \Rightarrow y = |1| = 1 \Rightarrow$ **(1, 1)**

$x = 2 \Rightarrow y = |2| = 2 \Rightarrow$ **(2, 2)**

We've got five points, enough to make a decent picture:



$y = |x|$

Convince yourself that our graph also contains the points (165, 165) and (–499, 499).

EXAMPLE 2: **Graph: $y = |x - 3| + 2$**

Solution: Don't panic! Let's just do what we did in the first example: Pick x-values off the top of our head, calculate the associated y-values, plot the points (x, y), and see what we get.

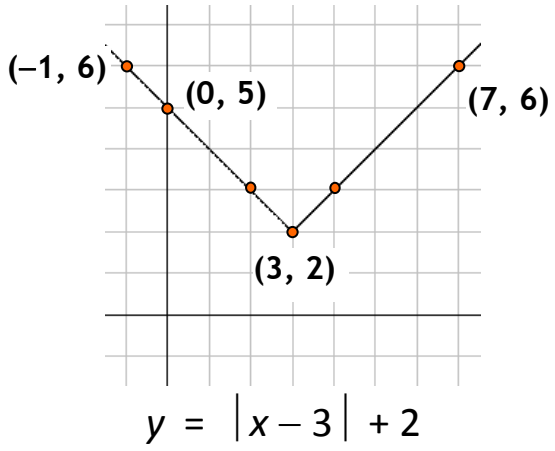
Setting x to 0 gives $y = |0 - 3| + 2 = |-3| + 2 = 3 + 2 = \mathbf{5}$.
We now have our first point on the graph: (0, 5).

Now set x to 7: $y = |7 - 3| + 2 = |4| + 2 = 4 + 2 = \mathbf{6}$.
Our new point on the graph is (7, 6).

One more — set x to –1: $y = |-1 - 3| + 2 = |-4| + 2 = 4 + 2 = \mathbf{6}$.
Our third point is (–1, 6).

We'll now construct an x-y table using the three points we've just calculated and some additional points; it's your job to verify the rest of the points.

x	y
–1	6
0	5
1	4
2	3
3	2
4	3
5	4
6	5
7	6

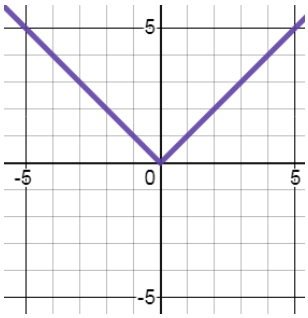


Items of Note:

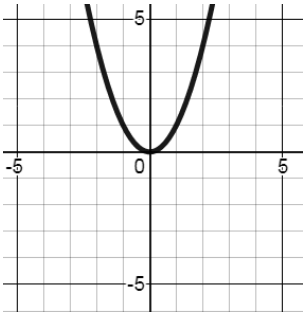
Later in your course, you will be asked what x-values are allowed in this formula. It may not be obvious, but x can take on any value; that is, x can be any real number.

As for y-values, the graph shows that y can't be any smaller than 2. That is, y has to be at least 2; we could even write $y \geq 2$.

The graph is certainly not a line; it's in the shape of a V. It is sharp at its bottom point (3, 2), not smooth and curvy like the graph of the parabola $y = x^2$ that you may have seen before.



$y = |x|$



$y = x^2$

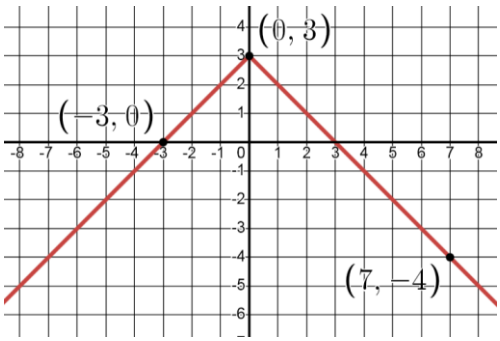
EXAMPLE 3: **Graph: $y = -|x| + 3$**

Solution: Setting x to 0 gives $y = -|0| + 3 = -0 + 3 = \mathbf{3}$.
We now have our first point on the graph: (0, 3).

Now set x to 7: $y = -|7| + 3 = -7 + 3 = \mathbf{-4}$.
Our new point on the graph is (7, –4).

One more: set x to –3: $y = -|-3| + 3 = -3 + 3 = \mathbf{0}$.
Our third point is (–3, 0).

Plotting these 3 points gives us a good idea of the graph (although more points would be a great idea).



Homework

1. Graph: $y = |x|$

2. Graph: $y = |x| + 3$

3. Graph: $y = |x| - 4$

4. Graph: $y = -|x + 2|$

5. Graph: $y = |x - 5|$

6. Graph: $y = -|x + 3| - 4$

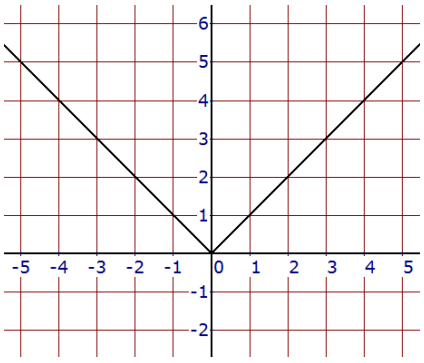
The absolute value of a positive number is itself.

The absolute value of 0 is 0.

The absolute value of a negative number is its opposite.

Solutions

1.



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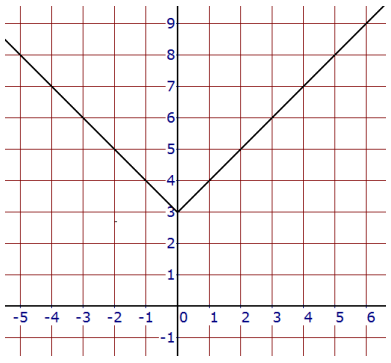

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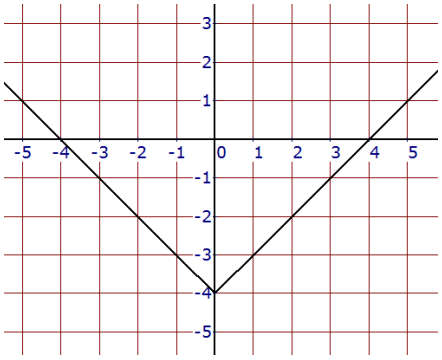

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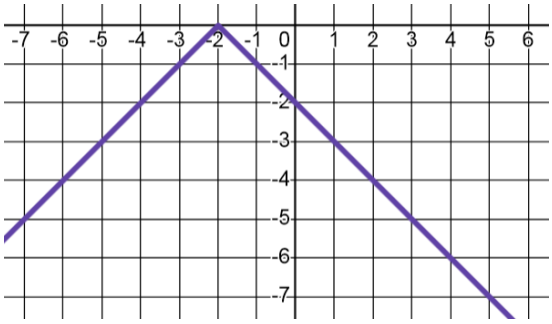

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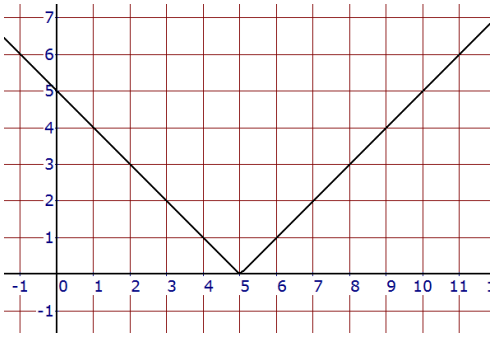

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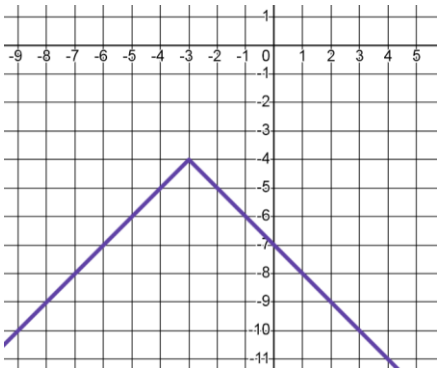

"The aim of education is the knowledge, not of facts, but of values."

— William S. Burroughs