
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:

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

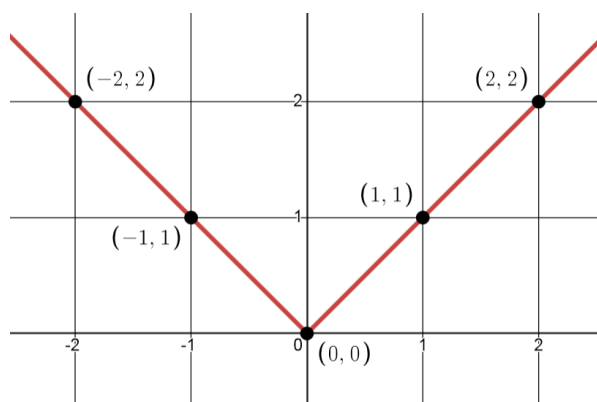
$$x = -1 \Rightarrow y = |-1| = 1 \Rightarrow (-1, 1)$$

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

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

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

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 $y = |0 - 3| + 2 = |-3| + 2 = 3 + 2 = 5$.

We now have our first point on the graph: $(0, 5)$.

Now set x to 7: $y = |7 - 3| + 2 = |4| + 2 = 4 + 2 = 6$.

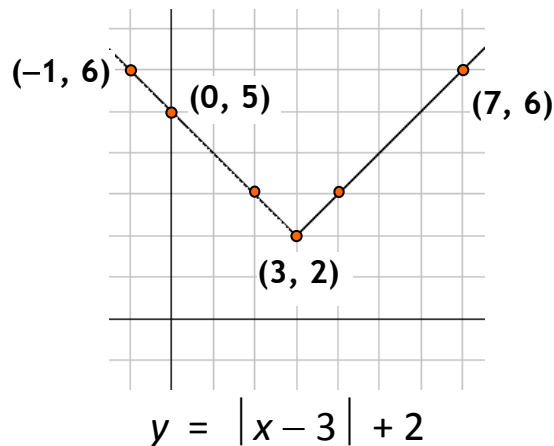
Our new point on the graph is $(7, 6)$.

One more — set x to -1 : $y = |-1 - 3| + 2 = |-4| + 2 = 4 + 2 = 6$.

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

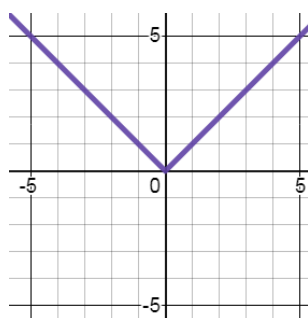


Items of Note:

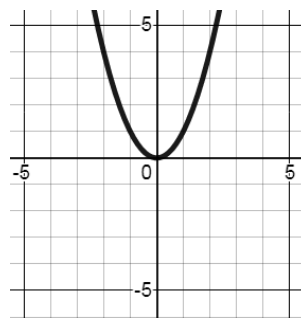
Later in your course, you will be asked what x -values are allowed in this formula. It may not be obvious, but x can take on any value; that is, x can be any real number.

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 $y = -|0| + 3 = -0 + 3 = 3$.

We now have our first point on the graph: $(0, 3)$.

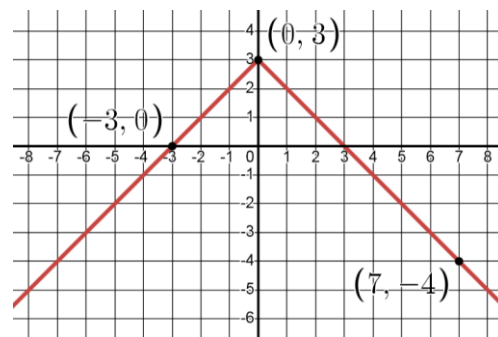
Now set x to 7: $y = -|7| + 3 = -7 + 3 = -4$.

Our new point on the graph is $(7, -4)$.

One more: set x to -3 : $y = -|-3| + 3 = -3 + 3 = 0$.

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: $y = -|x + 3| - 4$

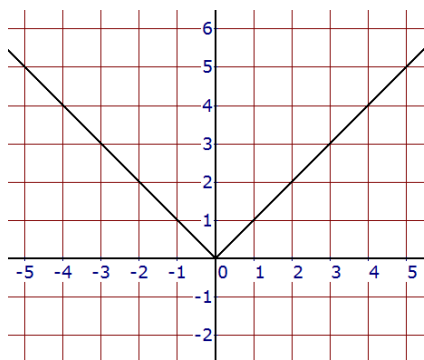
The absolute value of a positive number is itself.

The absolute value of 0 is 0.

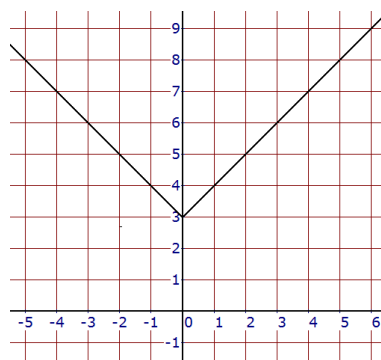
The absolute value of a negative number is its opposite.

Solutions

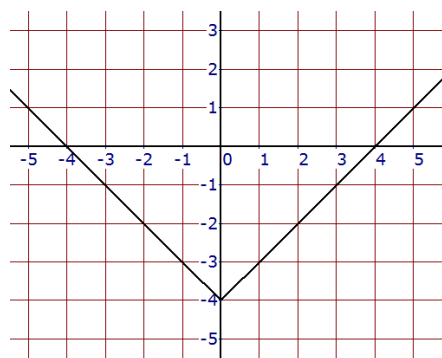
1.



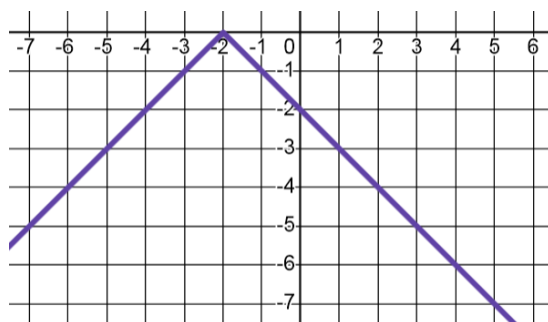
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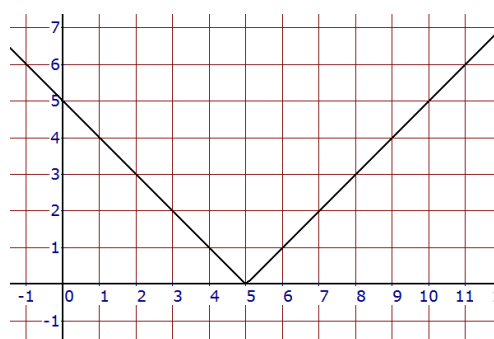
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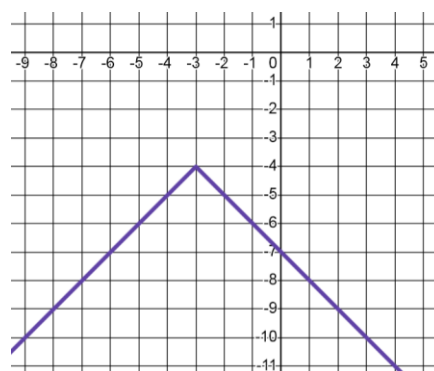
4.



5.



6.



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

— William S. Burroughs