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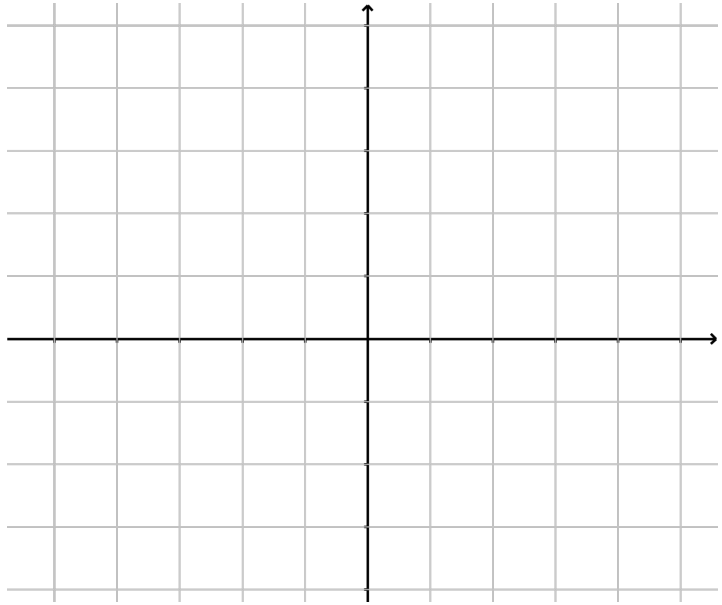

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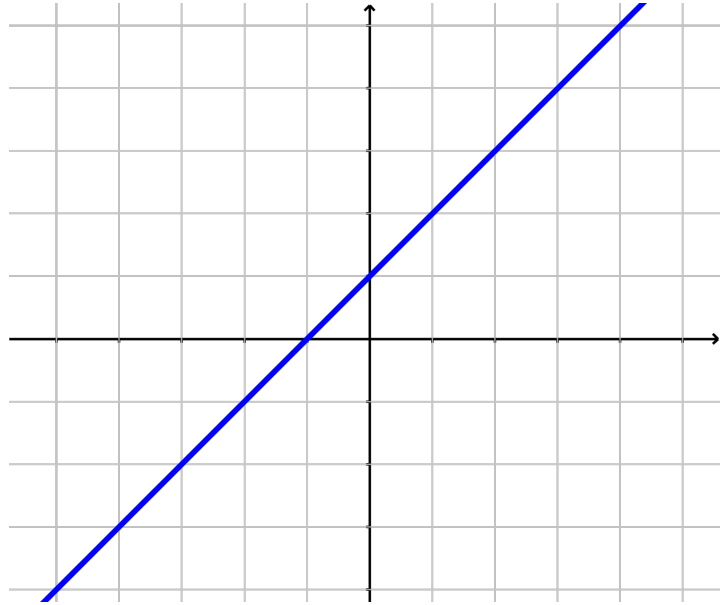
If we pick a random $x$ value, how many ordered pairs are there with that $x$-value?



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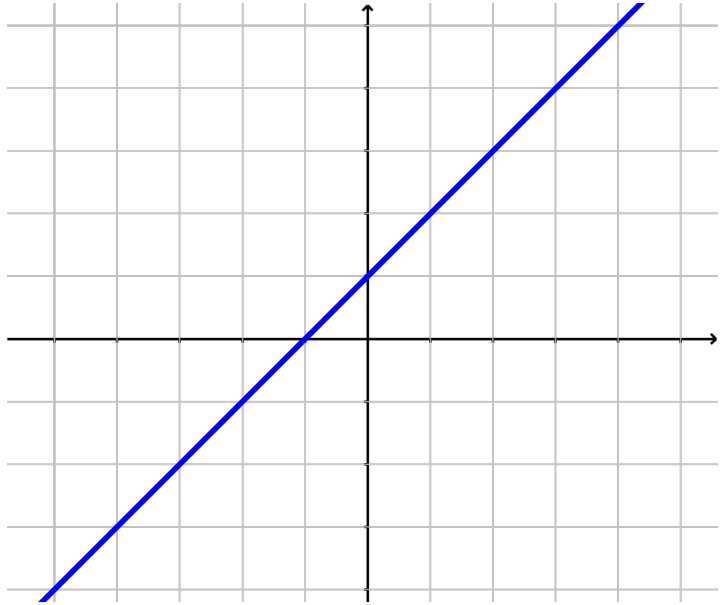

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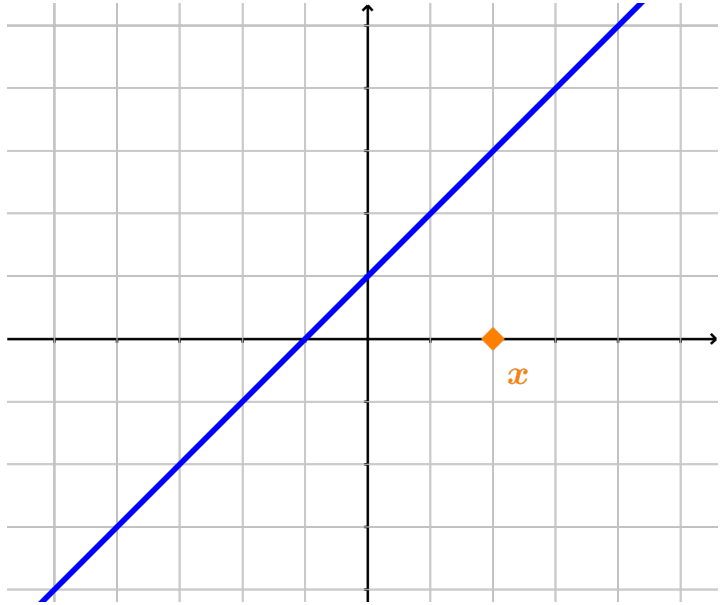

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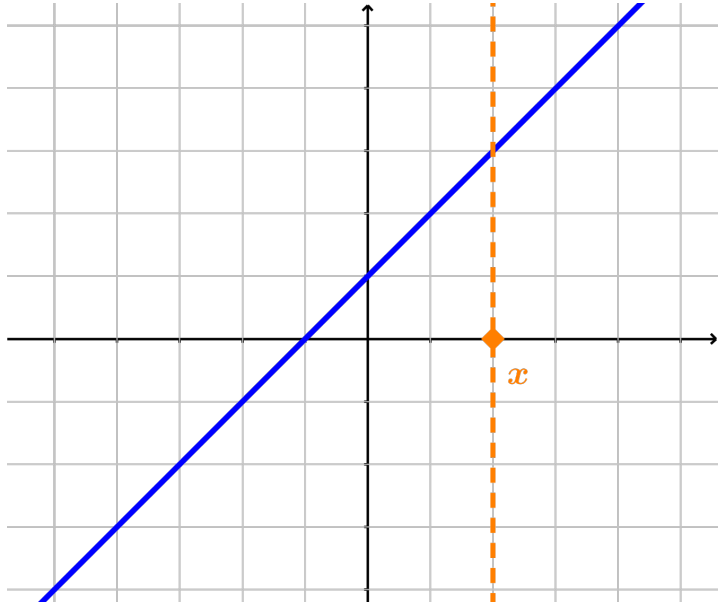
How many times does this hit the graph?



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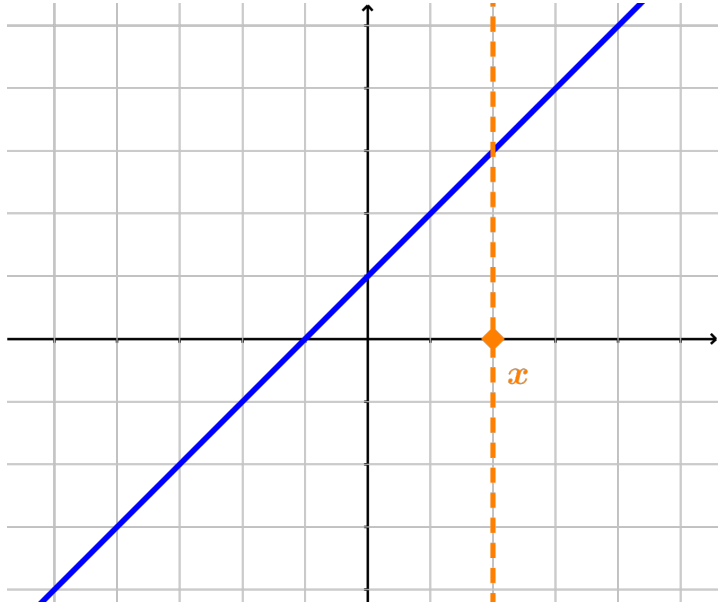
i.e. how many points on the line have that $x$-value?
Let's look at all of the points on the plane with that $x$-value
How many times does this hit the graph?
Since their is only one point with this $x$-value, it is a function



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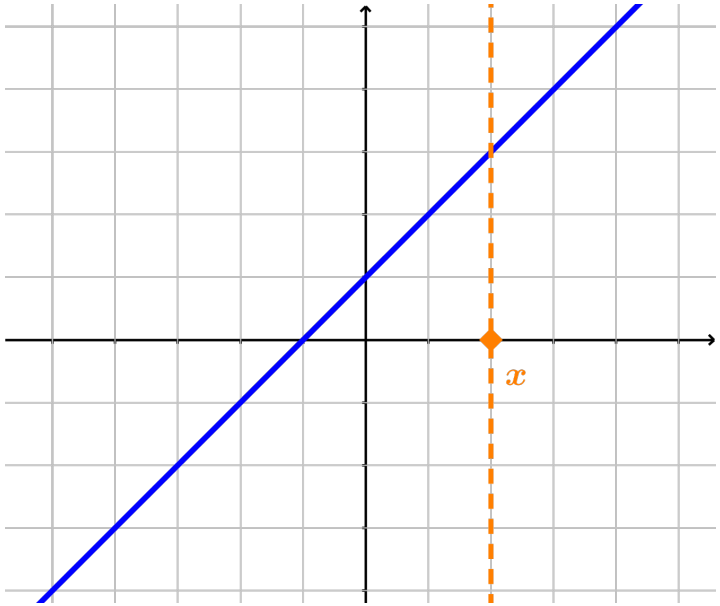


Determining if a graph is a function like this is called the
*Vertical Line Test*

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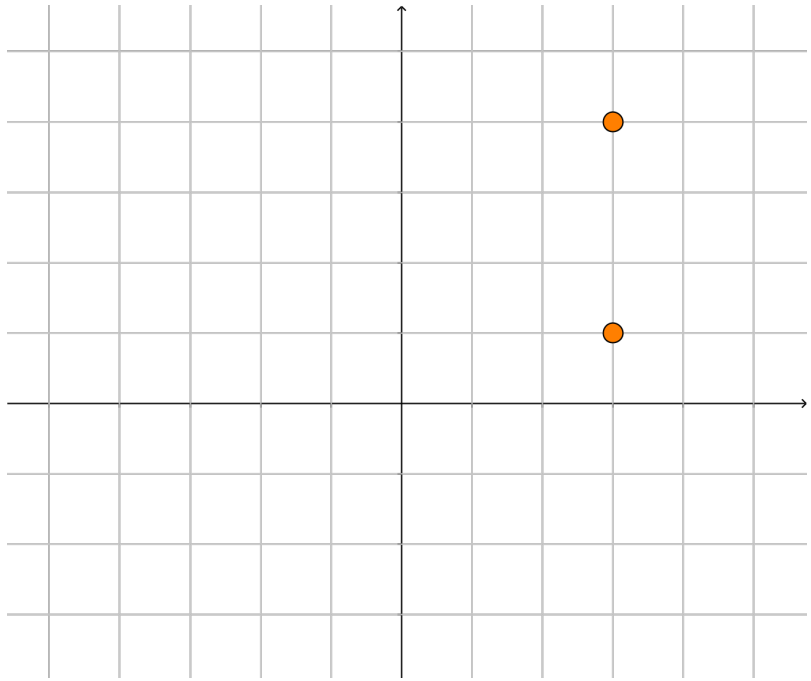

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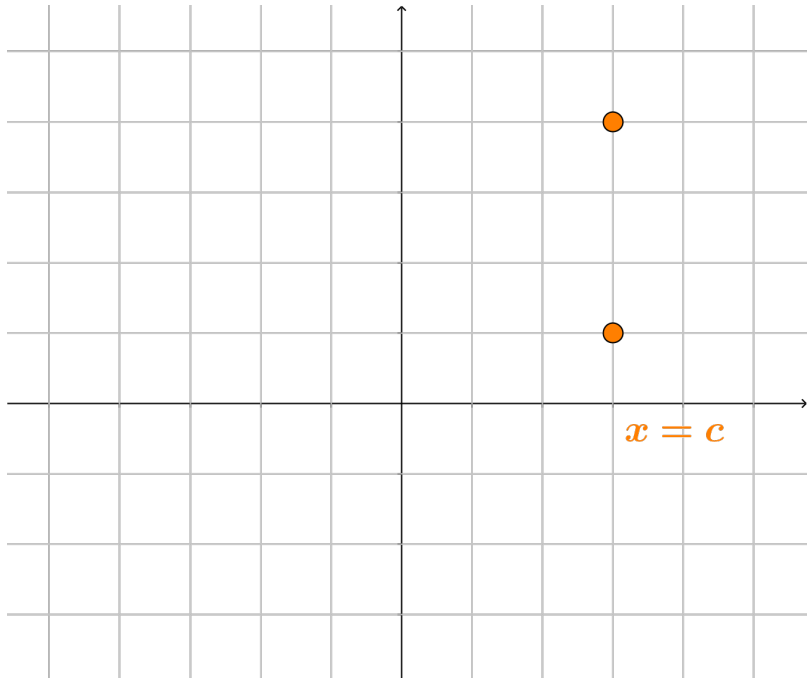
We tried to make an argument that a generic line is a function
Are all lines functions?
Are there any exceptions?
What if we have a line with two points with the same $x$-value
Let's say that $x$-value is: $x = c$



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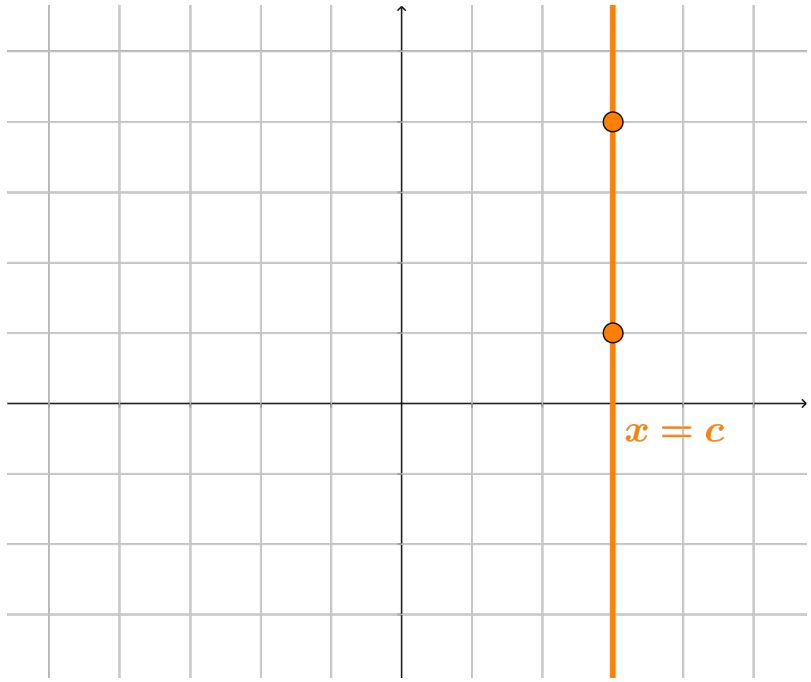
Are all lines functions?
Are there any exceptions?
What if we have a line with two points with the same $x$-value
Let's say that $x$-value is: $x = c$
With two points, we can determine the line through them



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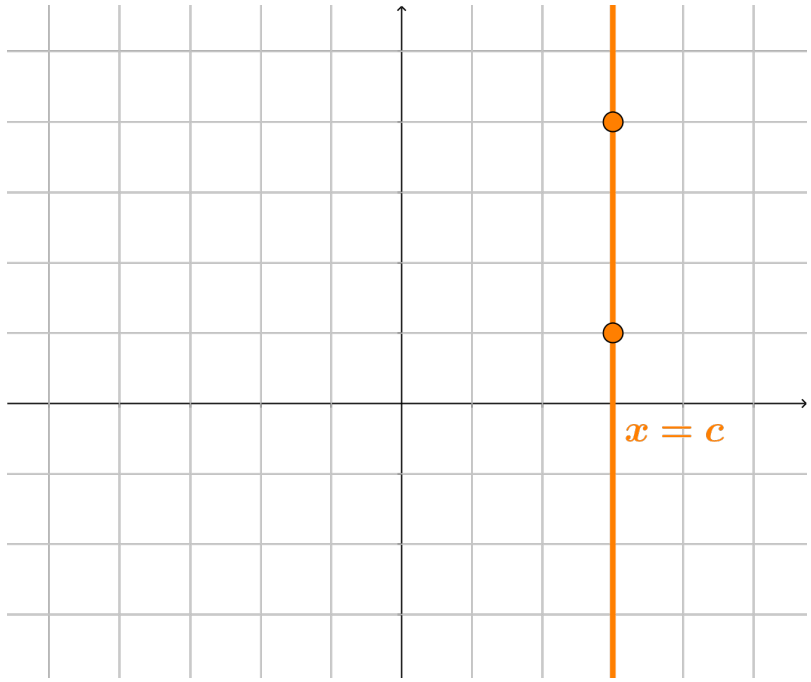
With two points, we can determine the line through them
This is a vertical line!



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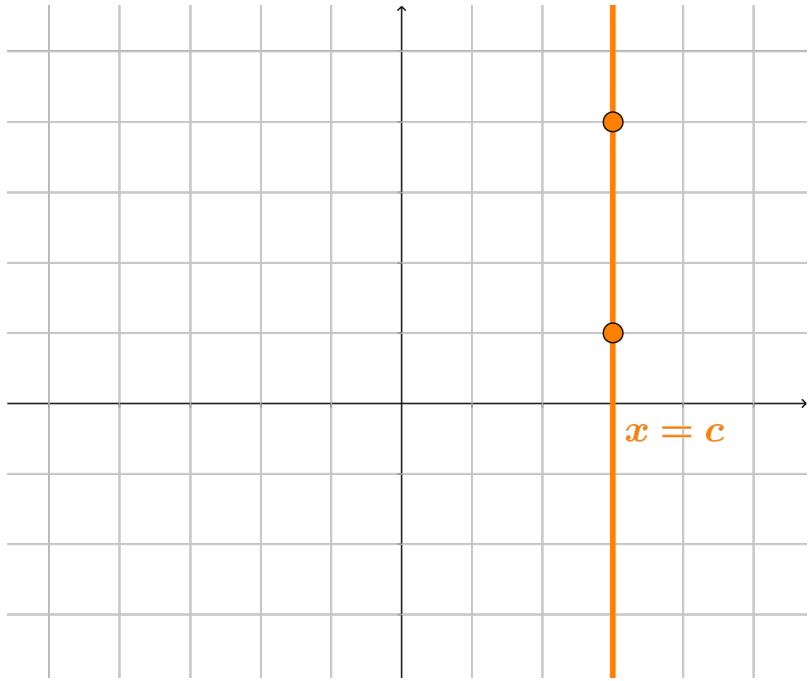
Are all lines functions?
Are there any exceptions?
What if we have a line with two points with the same $x$-value
Let's say that $x$-value is: $x = c$
With two points, we can determine the line through them
This is a vertical line!
The equation of the line is: $x = c$




**Conclusion:** The only lines that are not functions are vertical

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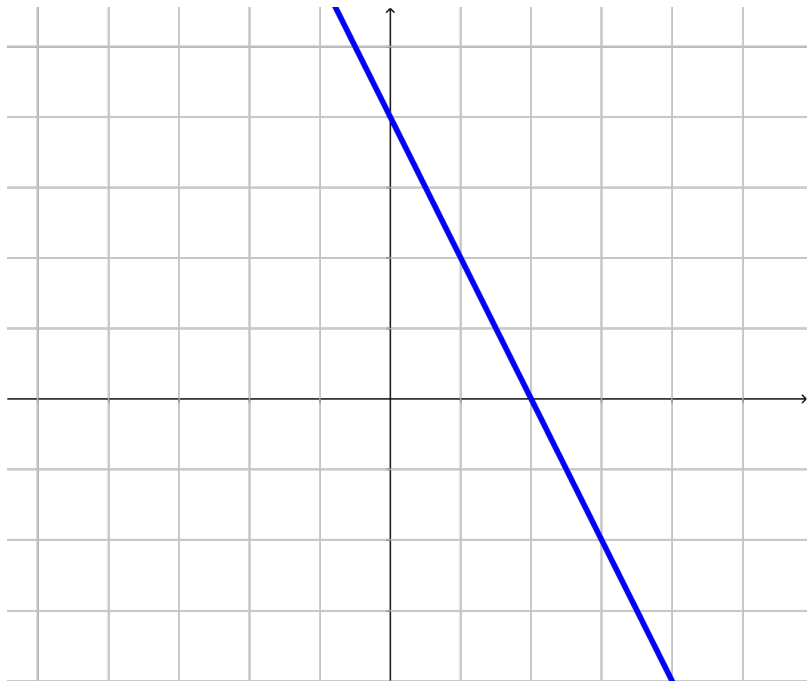
▸ We saw that if we start with $y = mx + b$



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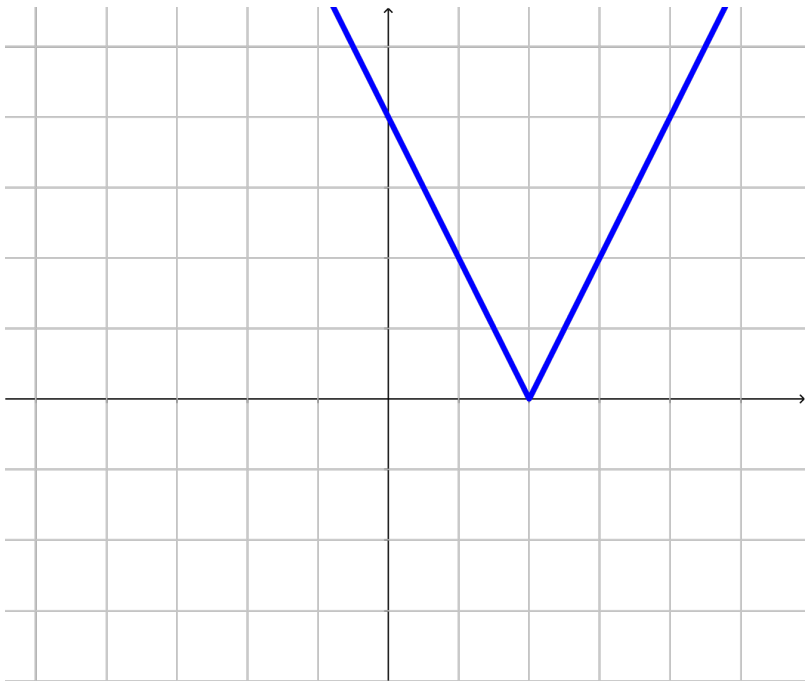
What if we include absolute values?
In particular, is $y = |mx + b|$ a function?
▸ We saw that if we start with $y = mx + b$
Taking the absolute value of the left hand side: $y = |mx + b|$
Makes all $y$-values positive



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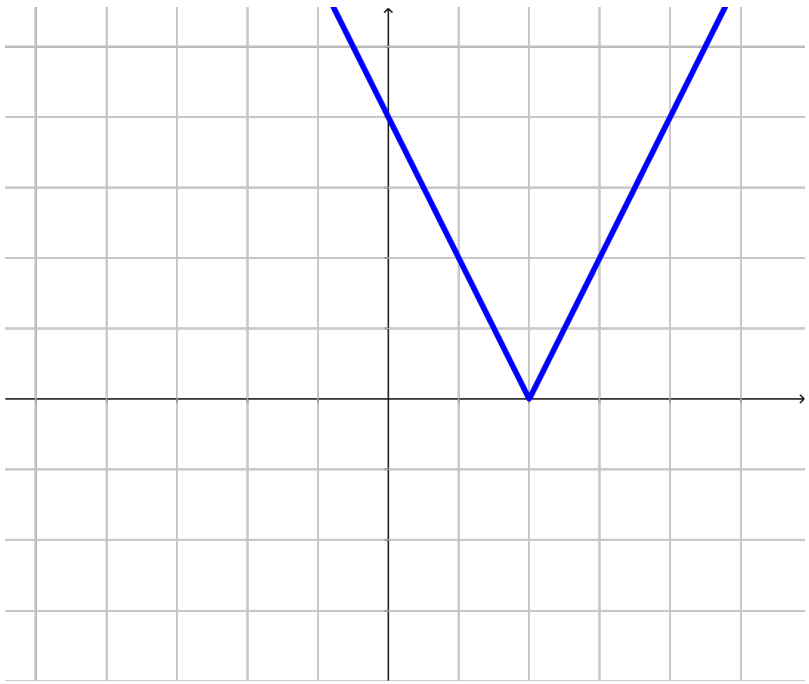
Is this a function?



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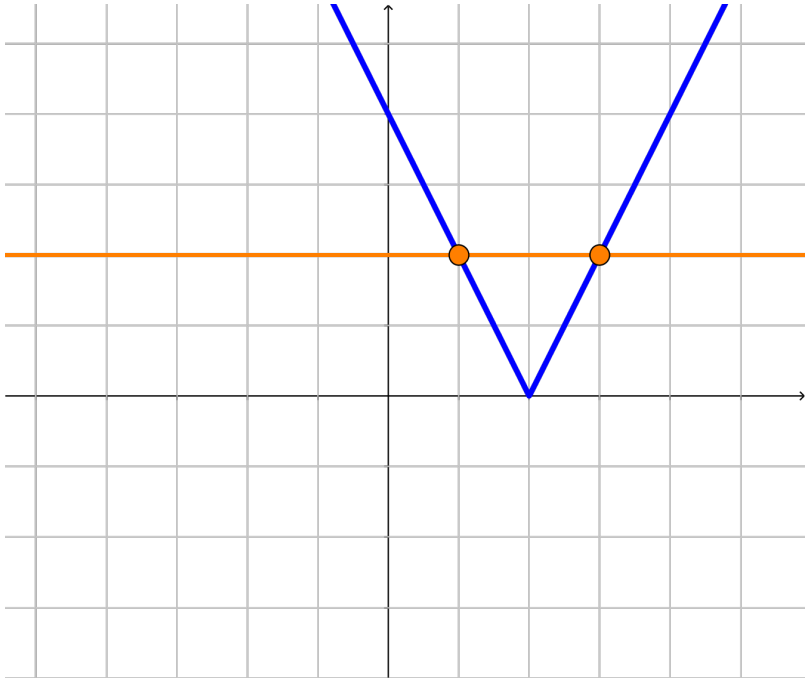

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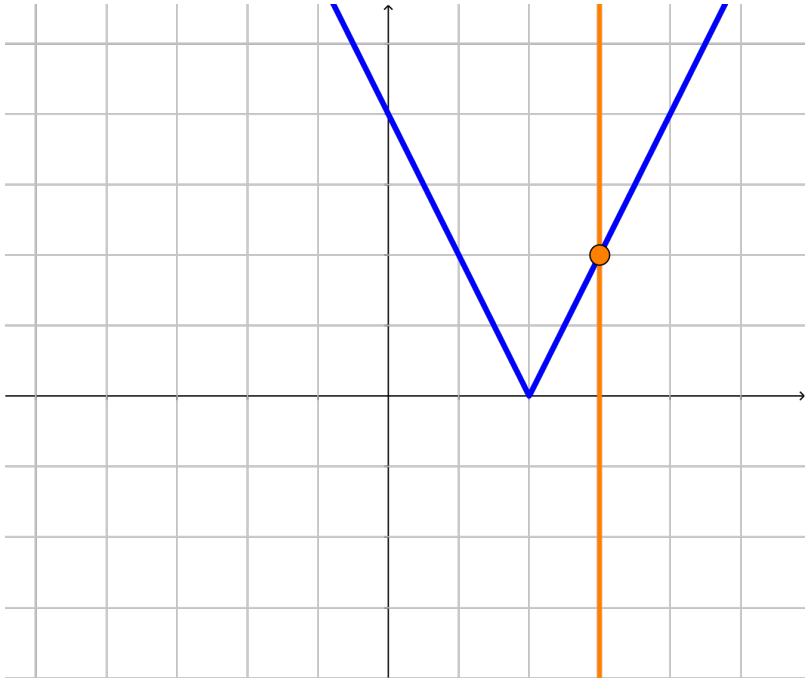

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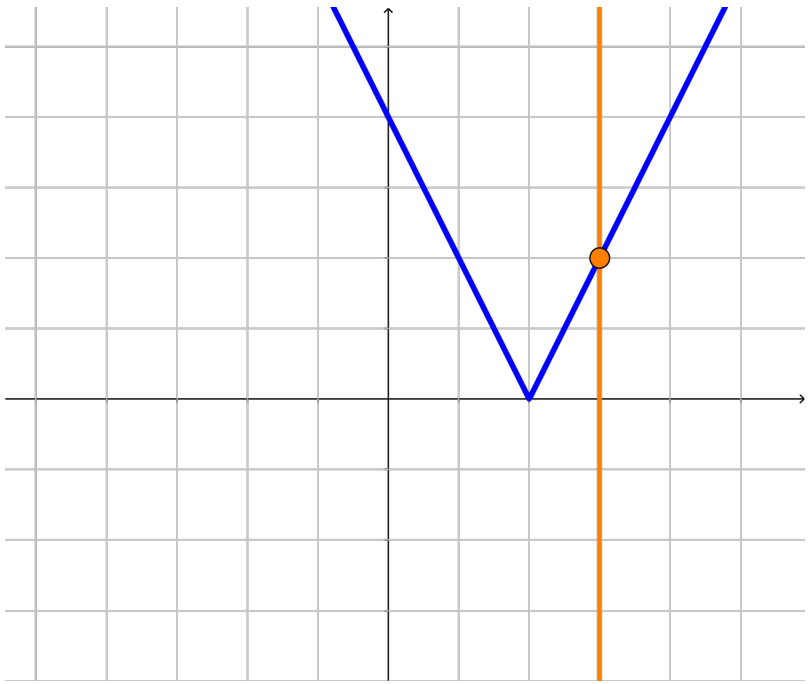

**Conclusion:** $y = |mx + b|$ is a function