

# Math 100A – Is It a Function?

A relation is a collection that tells you what input is paired up with what output. A **function** is a relation with one serious rule: *one input only has one output!* Here are the ways to check if the relation is actually a function.

1) **List of ordered pairs OR Table of input and outputs** – If you were given:

$\{(1, 1), (2, 3), (3, 5), (1, 7)\}$     or    

$x$	$y$
1	1
4	3
3	2

    or    

$x$	1	-1	2	0
$f(x)$	1	3	5	0

.

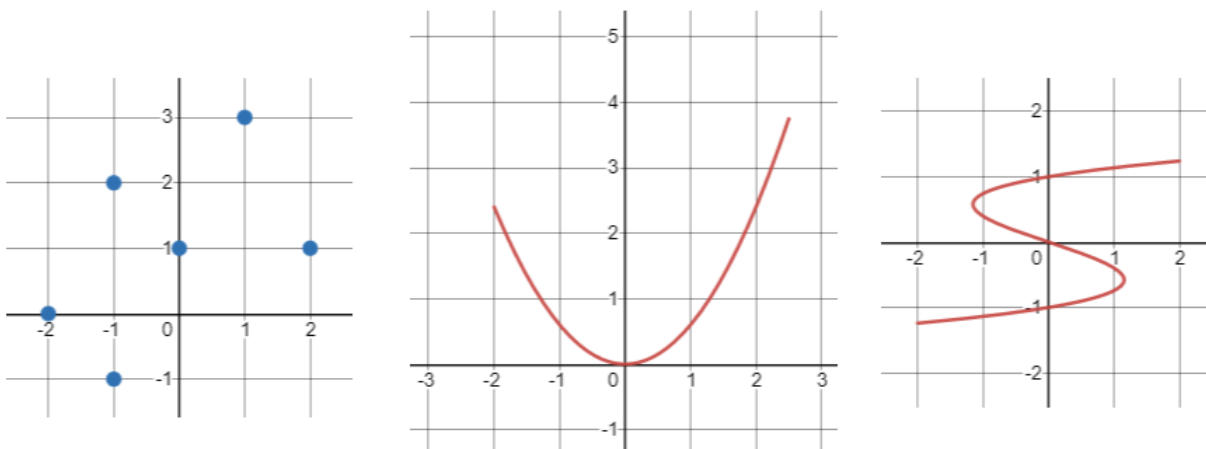
Ask yourself “Were all the input numbers in each pair  $(-, -)$  or each row unique?”

– If the answer is yes, then it’s a function!

– If the answer is no, you have one more thing to check: “for the input that repeated, did they actually have the same output and we just wrote the same thing twice?” If the answer is yes, then it’s a function!

If the answer is no, then it’s not a function :( .

2) **Graphs** – If you were given:



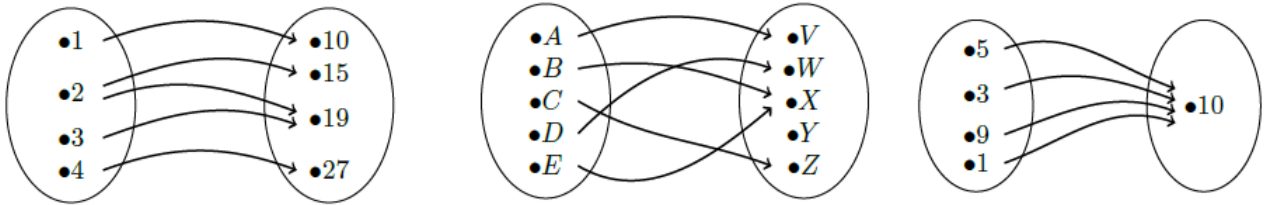
You have to use the **Vertical Line Test**: if you scanned the graph left to right with a straight up-and-down line, your line cannot hit more than one point.

– If it passes the Vertical Line Test, then it is a function.

– If it fails, then it is not a function.

\* Note that the left graph fails because the vertical line at  $-1$  hits two points  $(-1, 2)$  and  $(-1, -1)$ .

3) **Bubbles** — If you were given:



You have to examine the number of arrows coming out of numbers. The numbers that have the arrowhead (point-y side) are the outputs, so the numbers without an arrowhead is the input. Ask yourself “Did every number only have one arrow coming out of it?”

Caution! Don’t get tricked, sometimes they’ll repeat the same input but each copy only has one arrow!

— If each input only has one arrow coming out of it, then it is a function!

— If there’s an input that has two arrows coming out of it, then it is not a function :( .

— If there’s an input that’s repeated AND it has different outputs, then it is not a function :( .

## Bonus

The last thing in this handout is to talk about “Is [this] a function of [that]?”

When you see “is [this] a function of [that]”, the [that] is the input. The word or phrase or thing that comes after “of” is the input, while the thing that came before is the output.

So, like the stuff above, you have to ask yourself: is there a restriction or rule that prevents the [that]’s from having more than one output? If yes, then it’s a function. If not, then it is NOT a function since one input can have more than one output. Here’s a classroom example, so you can imagine it!

*Is the table you sit at a function of a person sitting there?*

For this, the input is “a person sitting there”. Ask yourself: is there a restriction or rule that prevents the person sitting at a table have two or more outputs? (The restriction is: a person cannot sit at two tables at the same time.)

*Is the person sitting at a table a function of the table they’re sitting at?*

The input is “the table they’re sitting at”. But, now there’s no restriction, a table can have multiple people sitting there.