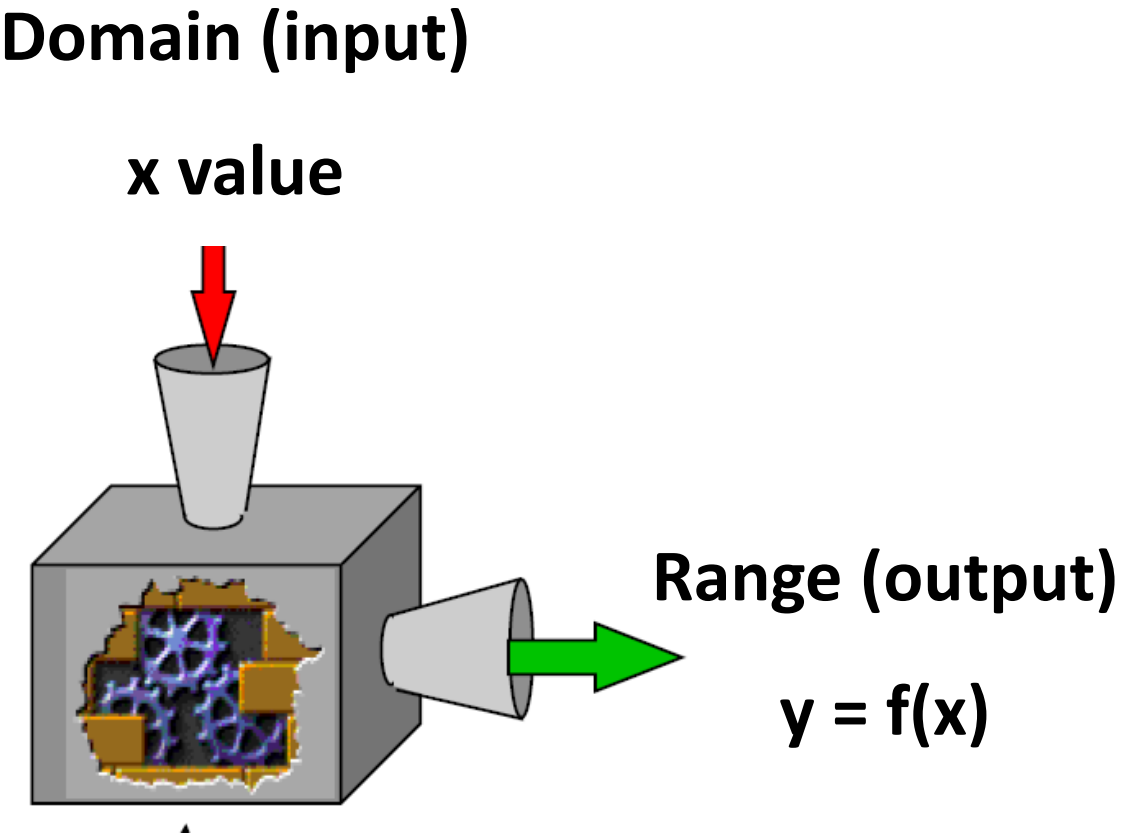
Functions and their Representations

Technical Definition of a Function

Definition of a Function

A set containing ordered pairs (x,y) defines y as a **function** of x if and only if no two ordered pairs in the set have the same x-coordinate. In other words every input maps to exactly one output. The **domain** of a function is the set of all possible inputs. The **range** of a function is the set of all possible outputs.



Example: Do the following sets of ordered pairs make functions of x? What are their domain and ranges?

a) {(2, 3), (4, 1), (3, -2), (2, -1)}

Is this set of ordered pairs a function of x? Yes No

Domain: _____ Range:_____

b) {(-2, 3), (4, 1), (3, -2), (2, -1)}

Is this set of ordered pairs a function of x? Yes No

Domain: _____ Range:_____

Example: Determine whether or not each of the following tables could be the table of a function. Explain why or why not.

a)

Input	Output
-1	4
0	7
1	-3
2	4
3	5

Could it be a function? Yes No

b)

Input	Output
-5	4
0	8
-1	-3
-2	4
-5	7

Could it be a function? Yes No

Example: Below is all the information about a function, H.

$$H(-1) = 0$$

$$H(2) = 5$$

$$H(6) = 9$$

Write H as a set of ordered pairs: _____

Write the domain of H:_____

Write the range of H:_____

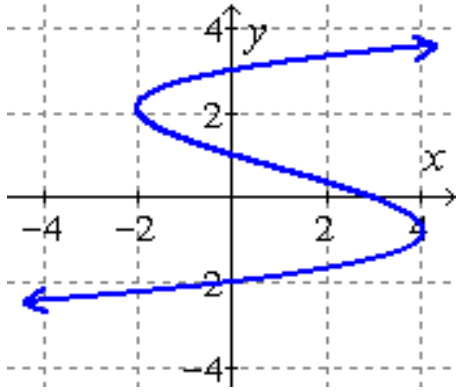
Vertical Line Test

The vertical line test is used to determine if a graph represents a function:

- If any vertical line passes through a graph more than once, then the graph does not represent a function.
- If no vertical line passes through a graph more than once, then the graph does represent a function.

Example: Which of the following are graphs of functions? In either case, state the domain and range of the relation.

a)

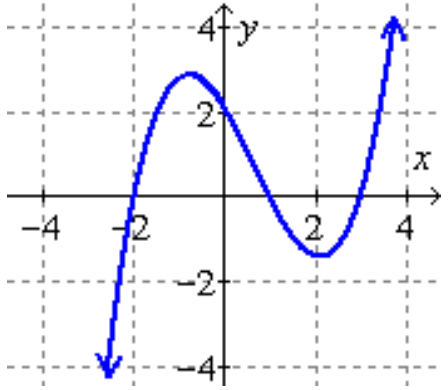


Is it a function? Yes No

Domain:_____

Range:_____

b)

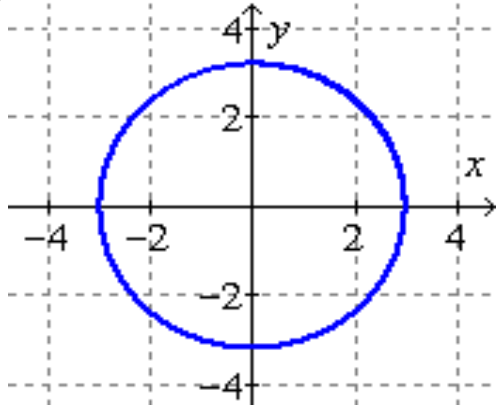


Is it a function? Yes No

Domain:_____

Range:_____

c)



Is it a function? Yes No

Domain:_____

Range:_____

Example: Determine whether the equation defines *y* as a function of *x*.

$a)\quad y-2x=-3$	$b)\ x=y^2+1$	$c)\ x^2=y-5$
Function? Yes No	*Yes No*	*Yes No*
$d)\quad x^2+y^2=4$	$e)\ y^4-x^3=1$	$f)\ \lvert y\rvert=x$
Function? Yes No	*Yes No*	*Yes No*
$g)\ y=\lvert x\rvert$	$h)\ y=\dfrac{x}{x-2}$	$i)\ y=\sqrt{x-1}$
Function? Yes No	*Yes No*	*Yes No*