

FUNCTIONS

A function connects two sets together, the input set and the output set. It is just an instruction on what you need to do to the input set to get the output set.

Ex.

Input set: all odd numbers starting from 1 to 11

Instruction (function): add 1 to each input

Output set: all even numbers starting from 2 to 12.

We can model this using a function table:

function: $f(x) = x + 1$	
Input set	Output set
1	2
3	4
5	6
7	8
9	10
11	12

The input set is called the domain and the output set is called the range.

Ex.

Given the input set $x = \{0, 1, 2, 3, 4\}$

Instruction: add 1 to each input set then double the sum.

$$y = 2(x+1)$$

$$f(x) = 2(x+1)$$

Output set: $y = \{2, 4, 6, 8, 10\}$

We can model this using a function table.

x	0	1	2	3	4
y	2	4	6	8	10

Ex.

Using the input set as $x = (-\infty, \infty)$

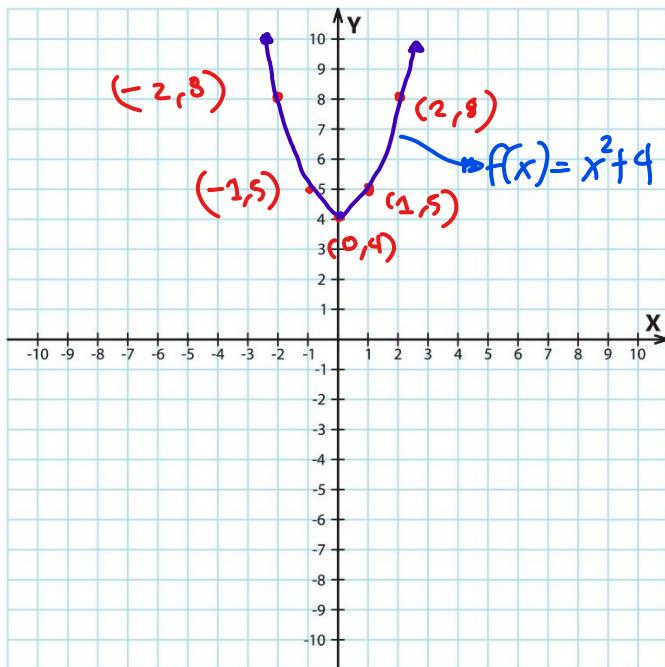
this means all the possible real numbers are included.

Instruction (function): $x^2 + 4$

(x, y) produces
an ordered pair.

We use
ordered
pairs to
graph a
function

x	-2	-1	0	1	2
y	8	5	4	5	8



$$f(x) = x^2 + 4$$

$$f(-2) = (-2)^2 + 4 = 4 + 4 = 8$$

$$f(-1) = (-1)^2 + 4 = 1 + 4 = 5$$

$$f(0) = 0^2 + 4 = 0 + 4 = 4$$

$$f(1) = 1^2 + 4 = 1 + 4 = 5$$

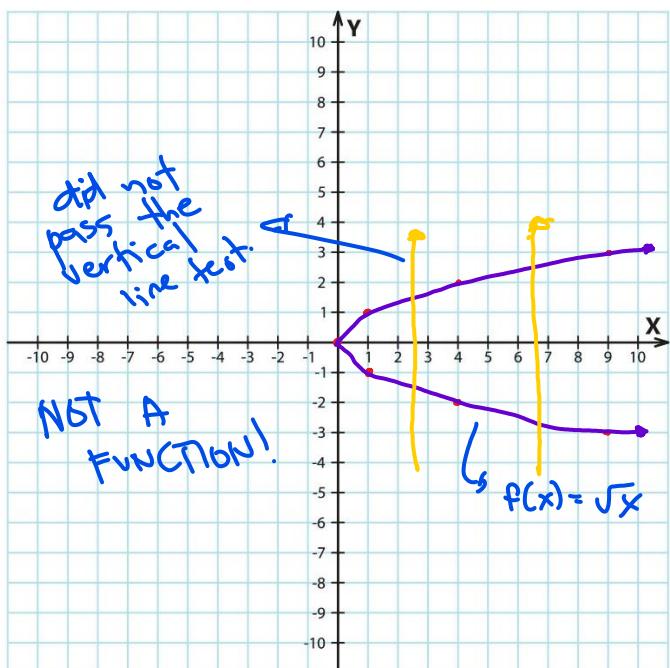
$$f(2) = 2^2 + 4 = 4 + 4 = 8$$

Ex. (Which graphs are not functions?)

$$y = \sqrt{x}$$

x	-1	0	1	4	9
y	no value	0	1, -1	2, -2	3, -3

here, there are more than 1 value for each input.
Not a function.



$$f(x) = \sqrt{x}$$

$$f(-1) = \sqrt{-1} = \text{invalid value}$$

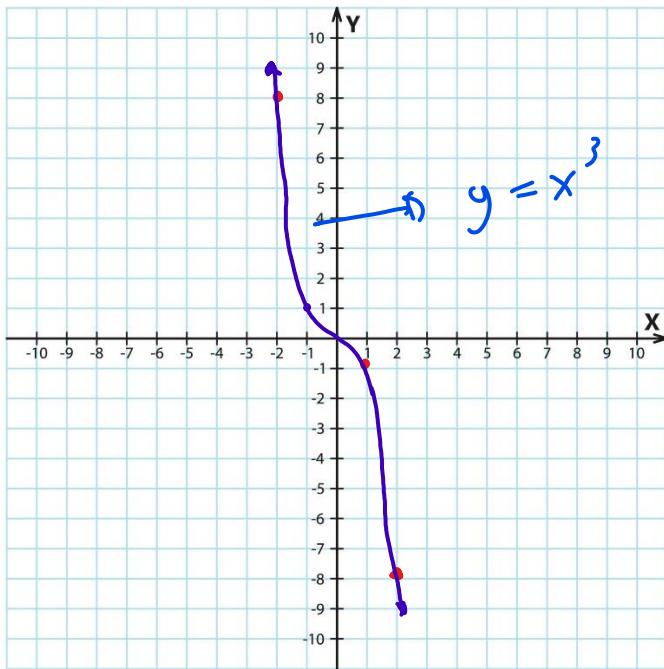
$$f(0) = \sqrt{0} = 0$$

$$f(1) = \sqrt{1} = +1, -1$$

$$f(4) = \sqrt{4} = +2, -2$$

$$f(9) = \sqrt{9} = +3, -3$$

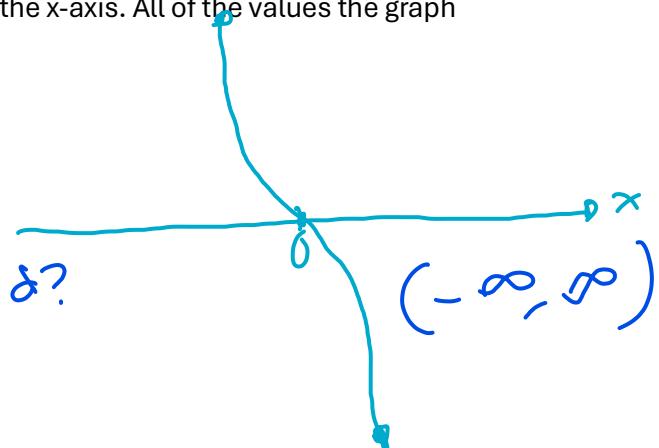
How do you determine the domain and range?



How to know the domain values?

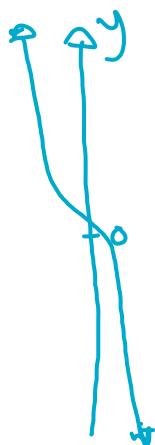
Draw the graph of the function but only with the x-axis. All of the values the graph covers is the domain.

If you extend this graph, which values on the x-axis are going to be covered?



How to know the range values?

Draw the graph but only with the y axis.



If you extend the graph, which values on the y-axis are going to be covered?

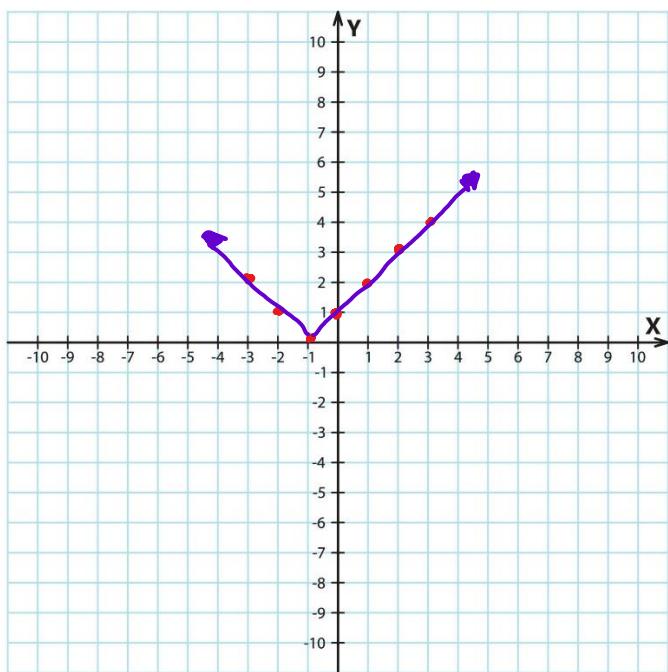
(-∞, ∞)

Bottom to top

Ex.

What is the domain and the range of this function?

$$f(x) = |x + 1|$$

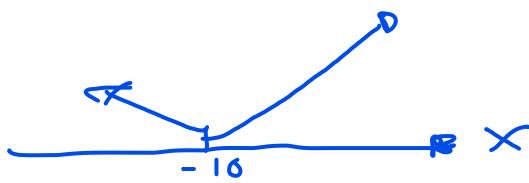


To answer this, first we need to graph the given function.

$$f(x) = |x + 1|$$

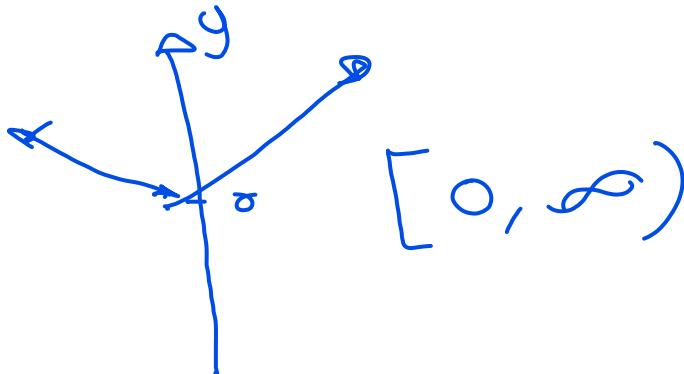
X	f(x)
-3	2
-2	1
-1	0
0	1
1	2
2	3
3	4

Domain :



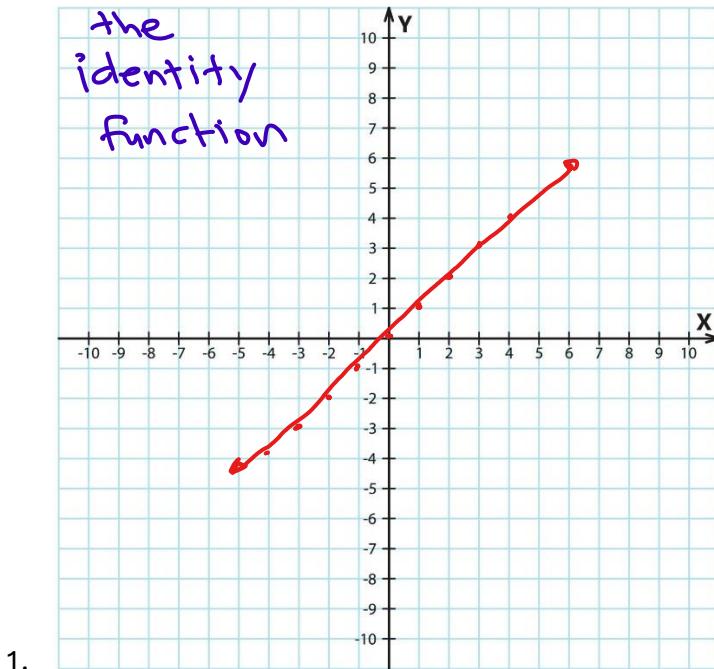
$$(-\infty, \infty)$$

Range ?



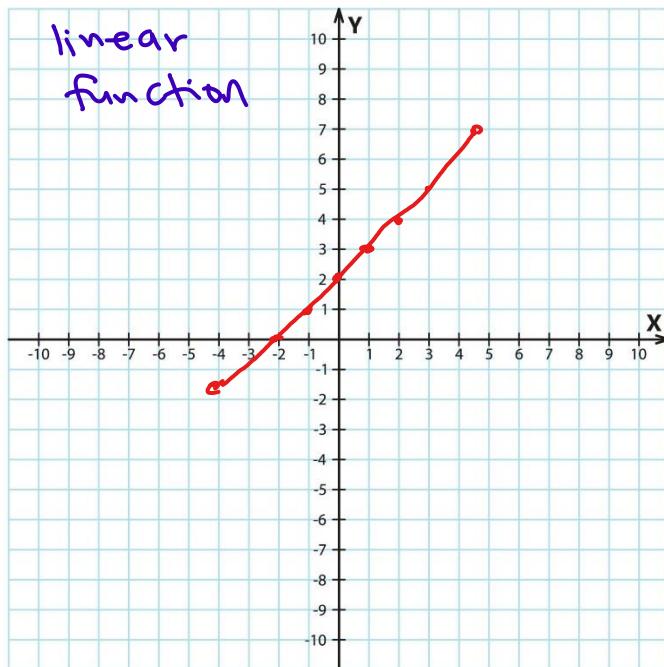
$$[0, \infty)$$

EXERCISE:



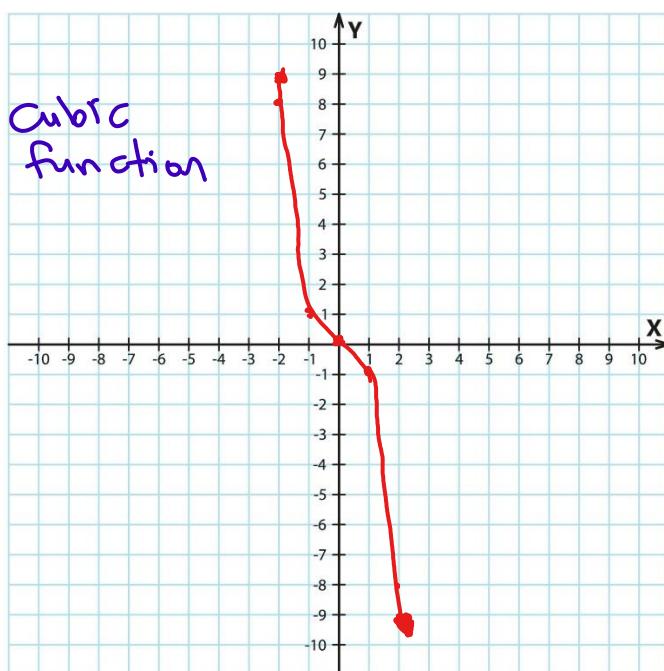
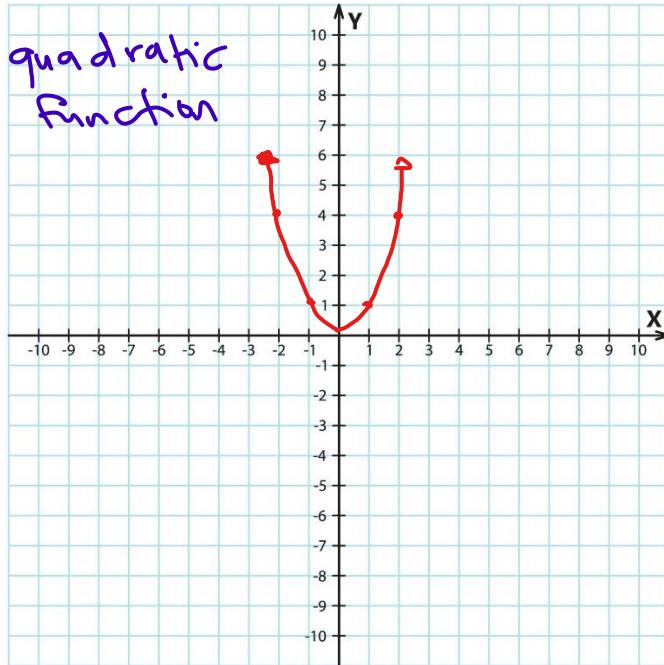
1.

$$f(x) = x$$
$$D = (-\infty, \infty)$$
$$R = (-\infty, \infty)$$



2.

$$y = x + 2$$
$$D = (-\infty, \infty)$$
$$R = (-\infty, \infty)$$



$$y = x^2$$

$$D = (-\infty, \infty)$$

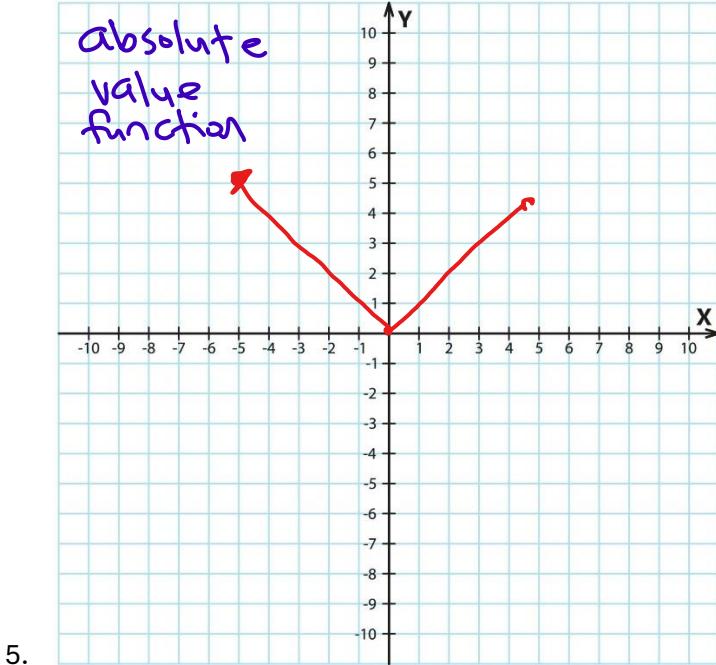
$$R = [0, \infty)$$

↳ because, when we see the graph from bottom to the top, we know that the only values the graph covers is from 0 to positive infinity

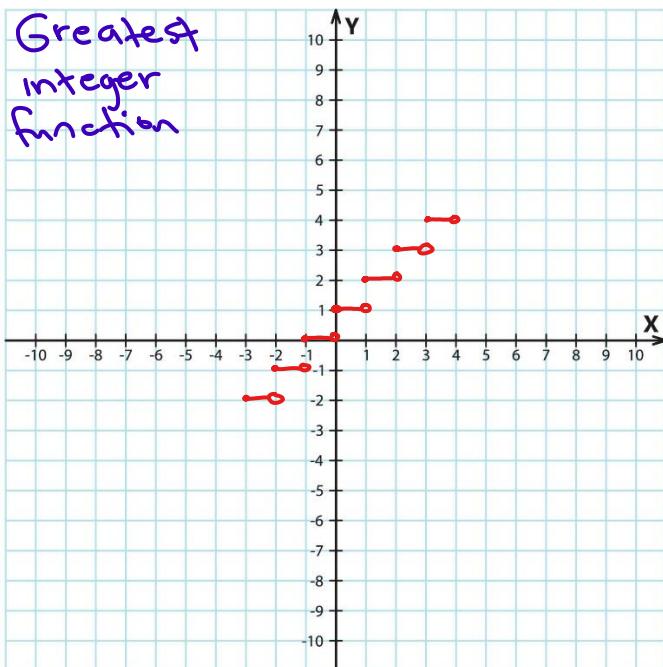
$$y = x^3$$

$$D = (-\infty, \infty)$$

$$R = (-\infty, \infty)$$



5.



6.

$$y = |x|$$

$$D = (-\infty, \infty)$$

$$R = [0, \infty)$$

$$y = \lfloor x \rfloor$$

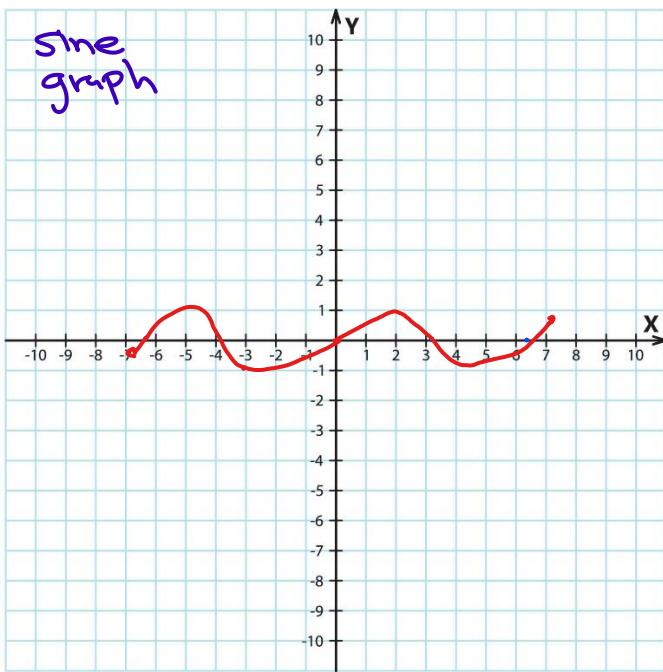
$$D = (-\infty, \infty)$$

$$R = \text{all integers}$$

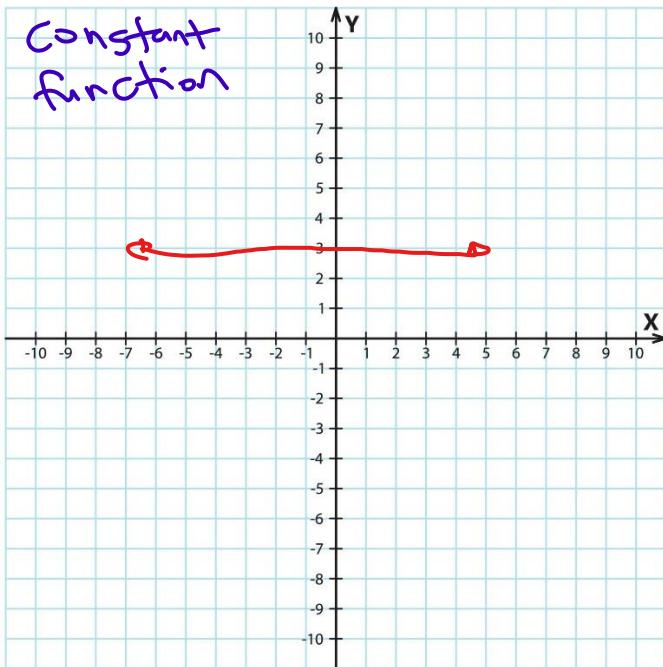
on the y axis, it only covers all integers and not the numbers in between.



Sine
graph



Constant
function



$$y = \sin x$$

$$D = (-\infty, \infty)$$

$$R = [-1, 1]$$

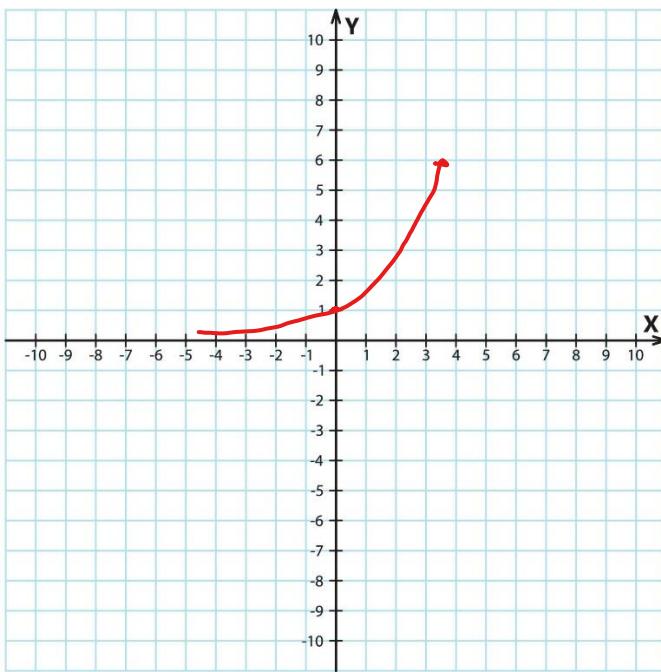
$$y = 3$$

$$D = (-\infty, \infty)$$

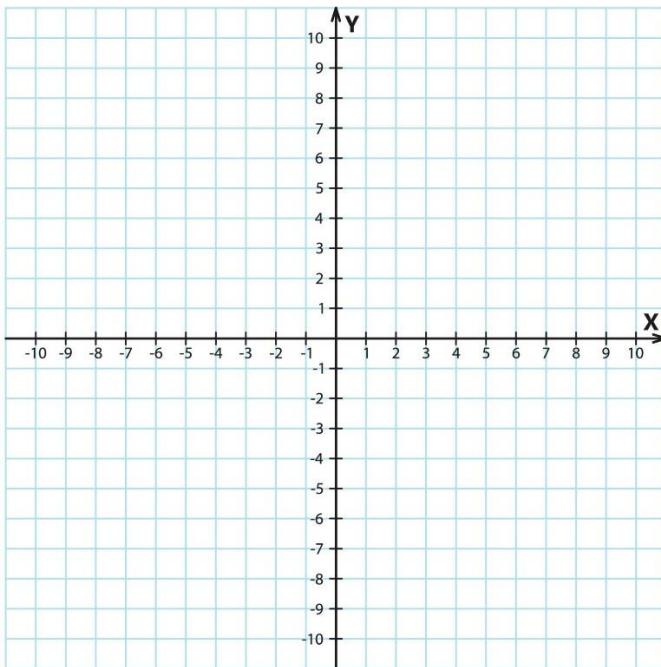
$$R = \{3\}$$



9.



10.



$$y = e^x$$

$$D = (-\infty, \infty)$$

$$R = (0, \infty)$$

↳ this is "open zero" because no matter how long you extend the graph, it only approaches zero, it's never touching it.