

Lecture 3

Wednesday, October 12, 2022 10:10 PM

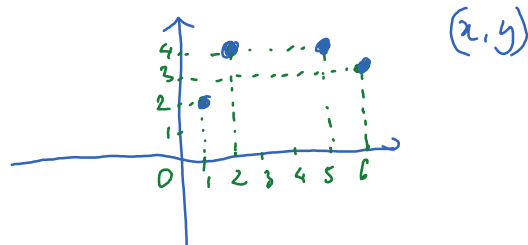
Relation: quantity x and quantity y

vector notation.

x	y
1	2
2	4
5	4
6	3

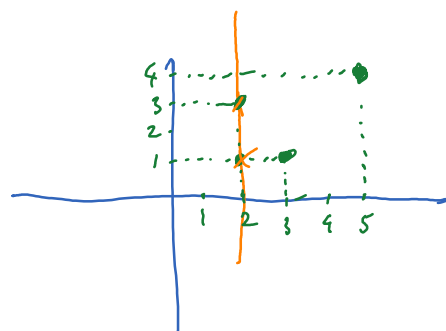
each $x \rightarrow$ one y
function

$\{(1, 2), (2, 4), (5, 4), (6, 3)\}$



x	y
2	1
2	3
3	1
5	4

$x=2 \rightarrow$
1
3
not a function



y is not a function of x .

Vertical line test: if y is a function of x then each vertical line intersect the graph at at most 1 point.

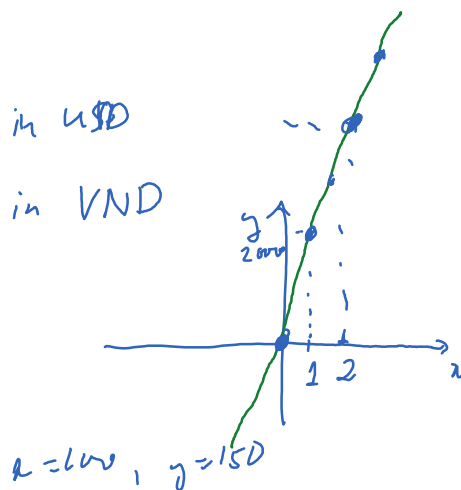
Equation:

x = # money you have in USD

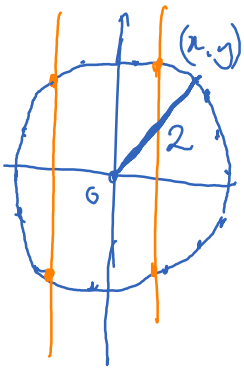
y = # money you have in VND

$$y = 20,000x$$

$$\begin{cases} x = 2y \end{cases} \rightarrow y = \underline{\underline{\frac{3x}{2}}}$$



Ex $x^2 + y^2 = 4$ not a function



Is y a function of x ?

↔ Is the relation between x and y a function?

How to find y from x ?

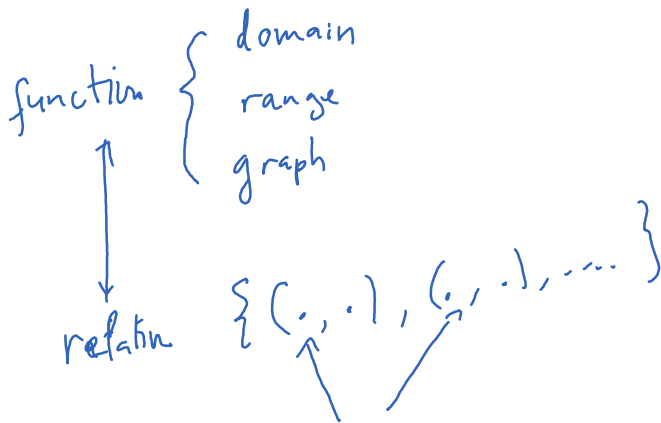
$$(x^2 + y^2 = 4) - x^2$$

$$y^2 = 4 - x^2$$

$$y = \pm \sqrt{4 - x^2}$$

$$x=1 \rightarrow \begin{matrix} \downarrow \\ 1^2 + y^2 = 4 \\ \downarrow \end{matrix} \rightarrow \begin{matrix} y^2 = 4 - 1 = 3 \\ y = \sqrt{3}, -\sqrt{3} \end{matrix}$$

$$x=1 \begin{cases} y = \sqrt{3} \\ y = -\sqrt{3} \end{cases}$$



domain = set of all x values

2	9
1	2
2	4
5	4
6	3

$$\text{domain} = \{1, 2, 5, 6\}$$

7 is not in domain

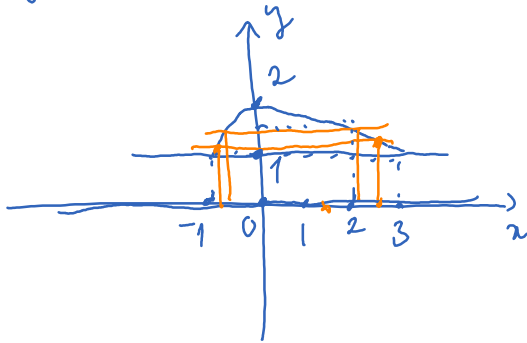
range = set of all y values

$$\text{range} = \{2, 4, 3\}$$

1 \notin range

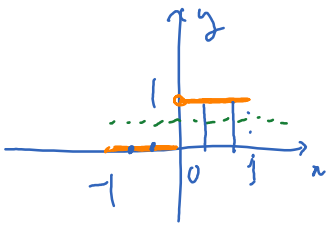
Ex

y is a function of x
graph is given as follows



$$\text{domain} = [-1, 3]$$

$$\text{range} = [1, 2]$$



$$\text{domain} = [-1, 1]$$

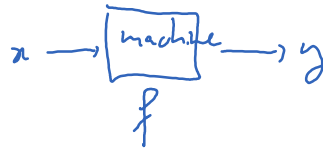
$$\text{range} = \{0, 1\}$$

y is a function of x

$x \rightarrow y$

x : input

y : output



$$y = f(x)$$

\uparrow out \uparrow input
 machine

Ex

Machine
|
Function

takes input x and does the following:

1) $+1$

2) square

3) take reciprocal

$$x \xrightarrow{+1} x+1 \xrightarrow{\text{square}} (x+1)^2 \xrightarrow{\text{reciprocal}} \frac{1}{(x+1)^2}$$

$$f(x) = \frac{1}{(x+1)^2}$$


$$f(x) = \frac{1}{(x+1)^2}$$

$$f(0) = \frac{1}{(0+1)^2} = \frac{1}{1^2} = 1$$

$$f(1) = \frac{1}{(1+1)^2} = \frac{1}{2^2} = \frac{1}{4}$$

$$f(-1) = \frac{1}{(-1+1)^2} \text{ undefined} \quad -1 \text{ is not the domain of } f.$$

domain of f is $\mathbb{R} \setminus \{-1\}$


$$= (-\infty, -1) \cup (-1, \infty)$$

range $(0, \infty)$
graph

