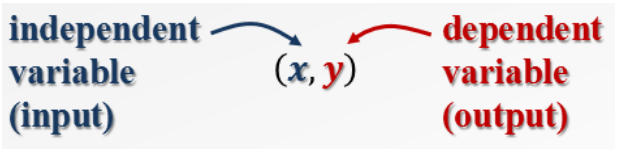
3.5 Concept of Function, Domain, and Range

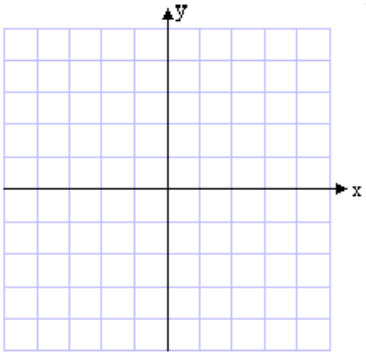
relation – any set of ordered pairs



Examples of relations:

1. Households assigned to each postmen in Abbotsford area.
   input ..... output .....

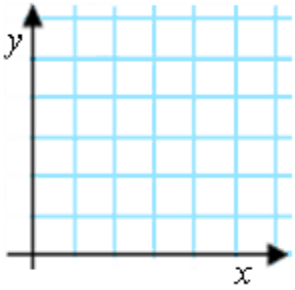
2. Points in the system of coordinates equidistant from $(0,0)$ and $(4,0)$.



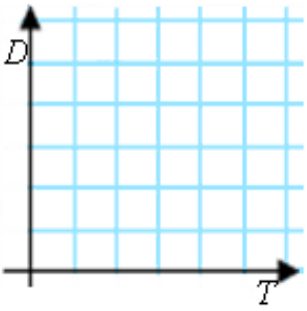
some ordered pairs that belong to the relation:

3. Correspondence of knowing each other among a randomly selected group of people.
   arrow diagram: set of ordered pairs: graph:

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



4. Distance D driven in a certain time T, assuming the constant rate R = 20kph.



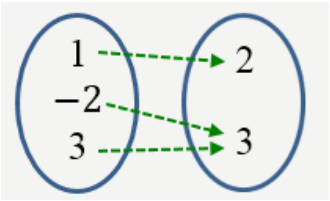
$D = 20T$

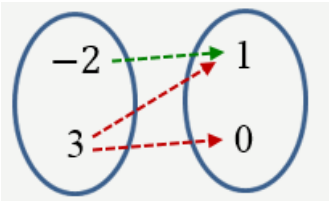
T	D

Definition:
A **RELATION** is any correspondence between the elements of the set of values of the independent variable, called the **DOMAIN**, and the elements of the set of values of the dependent variable, called the **RANGE**, such that each element of the domain and range are used at least once.

A **FUNCTION** is a relation that assigns a **unique output-value** from the range for every input-value from the domain.

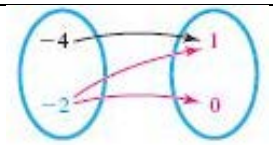
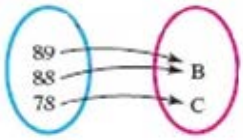
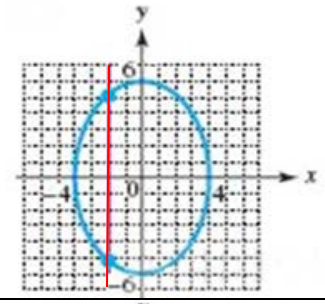
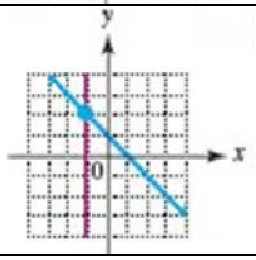
relation F relation H





F is a function H is not a function

How to recognize if a relation is a function?

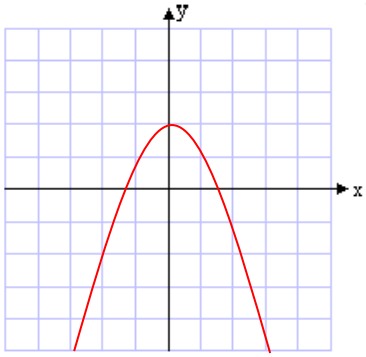
correspondence	test for being a function	domain	range
$\{(-3,1),(2,1),(2,0)\}$	no two pairs having the same first number and different second numbers		
$\{(-3,1),(2,1),(3,1)\}$	as above		
	no two arrows coming from the first set		
	as above		
	**VERTICAL LINE TEST: No vertical line crosses the graph more than once!**		
	as above		
$x = \lvert y \rvert$	there is only one y-value for every x-value		
$y = \frac{1}{x}$			
$y = \sqrt{x}$			

Practice:

1. Decide whether each relation defines a function, then give its domain and range.

a) $\{(-3,1),(1,-3),(2,0),(3,1)\}$

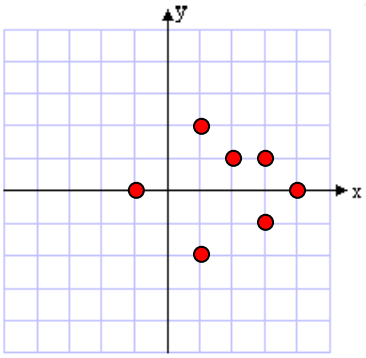
b)



c)

x	***y***
-1	1
0	-2
1	1
2	-1

d)



e) $y = \sqrt{2x - 1}$

f) $y = \frac{5}{x-5}$

g) $x + y < 3$