Section 5.2: Functions

Terms:

Domain: The first set of elements
Independent Variables
All x-values

Range: The Second set of elements
Dependent Variables
All y-values

Function: is a relation where each element in the domain is associated with only one element in the range

Example 1

1. Number of wheels

is the number of wheels on

1
2
3
4

Bicycle
Car
Motorcycle
Tricycle
Unicycle

Is this a function?

NO, because 2 wheels are on a motorcycle and a bicycle

Domain:

{1, 2, 3, 4}

Range:

{Bicycle, Car, tricycle, motorcycle, unicycle}

What if we reverse the order?

Has this number of wheels

Bicycle
Car
Motorcycle
Tricycle
Unicycle

1
2
3
4

Is this a function?

Yes, since each variable from the domain is connected to only 1 value from our 2nd set

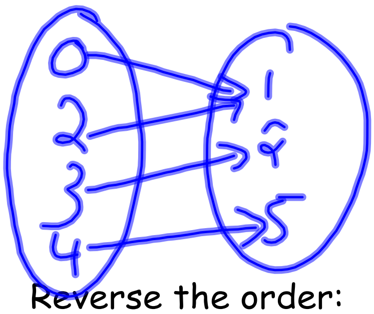
Domain:

{Bicycle, Car, tricycle, motor cycle, unicycle}

Range:

{1, 2, 3, 4}

Example 2
(0,1) (2,1) (3,2) (4,5)



Is this a function?

Yes.

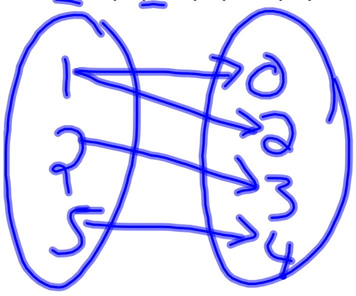
Domain:

$\{0,2,3,4\}$

Range:

$\{1,2,5\}$

Reverse the order:
(1,0) (1,2) (2,3) (5,4)



Is this a function?

Not

Domain:

Range:

Table/Ordered Pairs

Check the first column of the table or the first entry in each ordered pair for repetition.

- If there is no repetition the relation is a function.
- If there is repetition it is not a function.

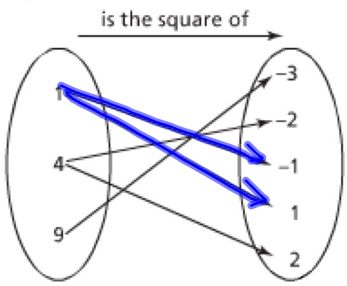
Arrow Diagrams

If a relation is a function:

- Elements in the domain should only have one line coming from it.
- Elements in the range can have more then one line going to it.

For each of the following:
i) Determine whether the relation is a function
ii) Identify the domain and range of each relation that is a function.

a) The arrow diagram shows the relation between a number and its square root.



i) Not a function.

b) The table shows the cost of student bus tickets, C dollars, for different numbers of tickets n.

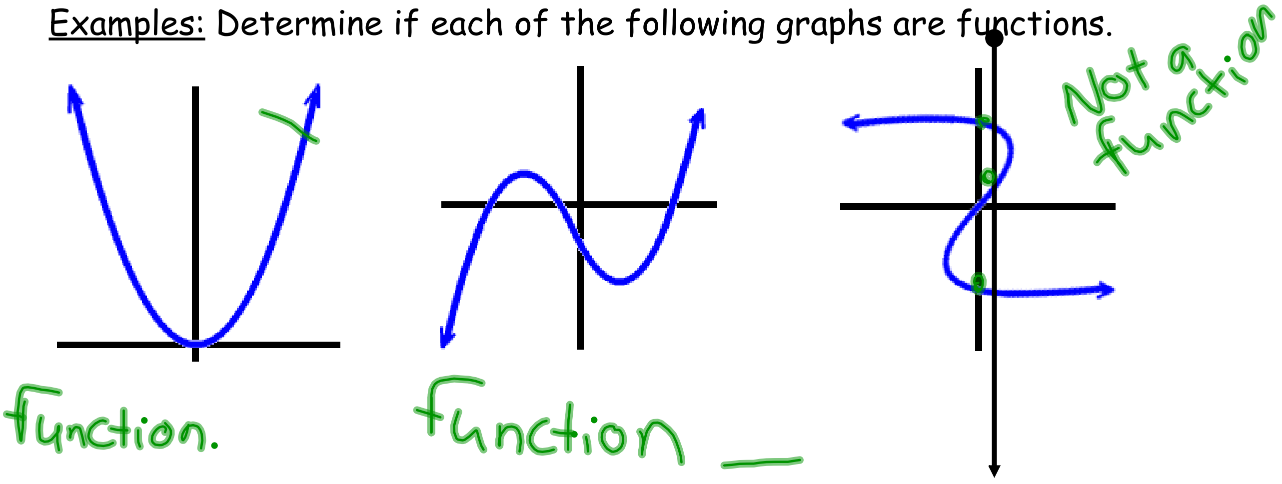
Number of Tickets, n	Cost, C (\$)
1	1.75
2	3.50
3	5.25
4	7.00
5	8.75

i) IS a function.
ii) Domain:
$\{1, 2, 3, 4, 5\}$
Range:
$\{1.75, 3.50, 5.25, 7.00, 8.75\}$

Vertical Line Test:

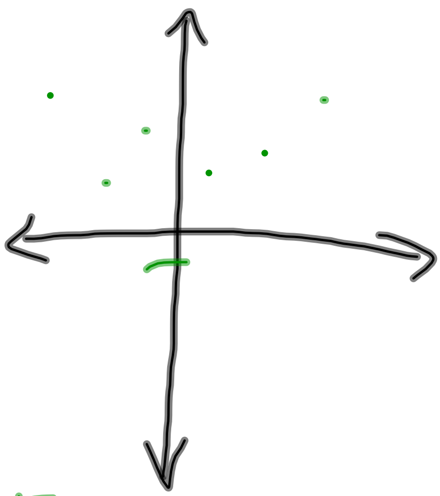
- A method used to determine if the graph of a relation is a function.
- If a vertical line cuts a graph in more than one place it is not a function.
    - Because there would be more than one y-value for that value of x.

Examples: Determine if each of the following graphs are functions.

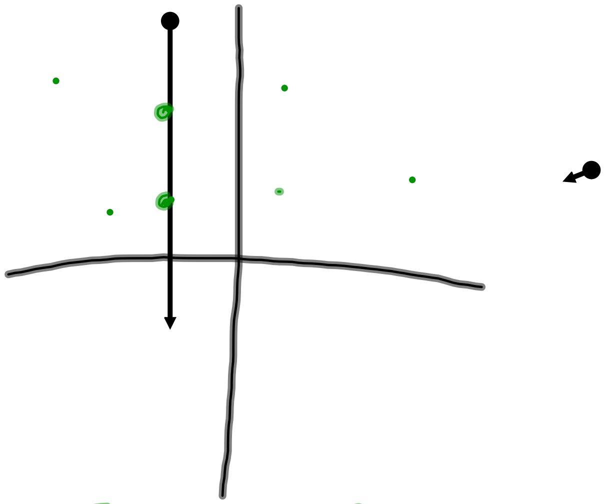


function.

function



IS a function



IS Not a function

$y = 2\underline{x} + 3$

FUNCTION NOTATION:

Equations that represent functions can be written in function notation.

- f(x) {read "f is a function of x"}.
- f(x) can be thought of as another way of representing the y-value.

$f(x) = 2x + 3$

When using function notation, the letter(s) inside the parentheses indicate the independent variable(s).

Example 1: Change the following equations into function notation and identify the independent variables:

a) y=5x+7 $f(x) = 5x + 7$ x -> Independent Variable

b) $h=2t^2-3t$ $f(t) = 2t^2 - 3t$ t -> Independent.

c) C= 4.5d

$f(d) = 4.5d$ d = Independent.

We can use function notation to determine the related range value (y-value) given a value in the domain (x-value).

Example 2: If $f(x) = 3x-2$ determine the following

$f(5) = 3(5) - 2$
$= 15 - 2$
$= 13$

$f(-3) = 3(-3) - 2$
$= -9 - 2$
$= -11$

$f(0) = 3(0) - 2$
$= 0 - 2$
$= -2$

We can also work backwards, that is, find the input value when you know the output value.

Example 3: If g(k) =3+2k determine k so that:

g(k) = 9

$9 = 3 + 2k$

$9 - 3 = \cancel{3 - 3} + 2k$

$\frac{6}{2} = \frac{2k}{2}$

$k = 3$

g(k) = 15

$15 = 3 + 2k$

$15 - 3 = \cancel{3 - 3} + 2k$

$\frac{12}{2} = \frac{2k}{2}$

$6 = k$

g(k) = -7

$g(k) = 3 + 2k$

$-7 = 3 + 2k$

$-7 - 3 = \cancel{3 - 3} + 2k$

$\frac{-10}{2} = \frac{\cancel{2}k}{\cancel{2}}$

$k = -5$