$A = \{1, 2, 3, 4\}$ ← set of inputs, called the domain

$B = \{5, 6, 7, 8\}$ ← set of outputs, called the range.

$f(1) = 6$
$f(2) = 7$
$f(3) = 5$
$f(4) = 8$

Def^n: The <u>domain</u> of a function is the set of all possible inputs.

Def^n: The <u>range</u> of a function is the set of all possible outputs.

<u>Dependent ~~&~~ & Independent Variables</u>

1. A variable y is a function of a variable x if each value of x (input) corresponds to exactly one value of y (output). In this case we say

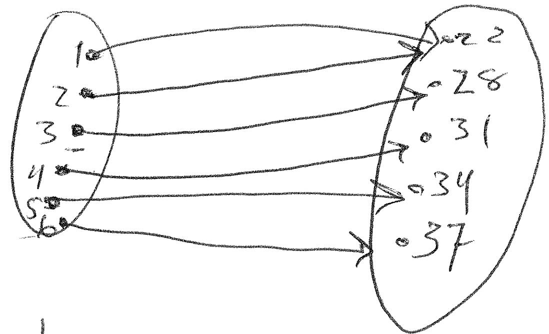
"y is a function of x"

2. If y is a function of x, then x is called the <u>independent variable</u> and y is called the <u>dependent variable</u>

Eg:

x	y
1	22
2	22
3	28
4	31
5	34
6	37

a) Is y a function of x?
If so, which is the dependent variable and which is the independent variable?



~~This is a function~~

y is a function of x.

Given a value of x; this determines exactly one value of y.

Dependent variable is y, independent variable is x.

b) Is x a function of y?

No. Given the value $y=22$, (input), there are two choices for the output: either $x=1$ or $x=2$.

Net Change

If y is a function of x, then we can find the net change in the variable y between inputs $x=a$ and $x=b$, where $a<b$. The net change is the difference between the y-value at $x=b$ and the

y-value at $x=a$.

E.g.:

x (year)	y (dollars)
1996	1.32
'97	1.33
'98	1.16
'99	1.36
2000	1.66
'01	1.64
'02	1.51
'03	1.83
'04	2.12
'05	2.17
'06	2.81

y - average gas price in California at year x.

"y is a function of x"

Find the ~~ave~~ net change in average gas price in California from 1996 to 1998.

We have two input values $x=1996$ and $x=1998$. The net change is the difference between y when $x=1998$ and y when $x=1996$.

$$1.16 - 1.32 = -.16$$

The average gas price had a net decrease of 16 cents from 1996 to ~~19~~ 1998.

Find the net change from 1996 to 2006.

$$2.81 - 1.32 = 1.49$$

The net change between '96 and '06 is an increase of \$1.49. (net increase)

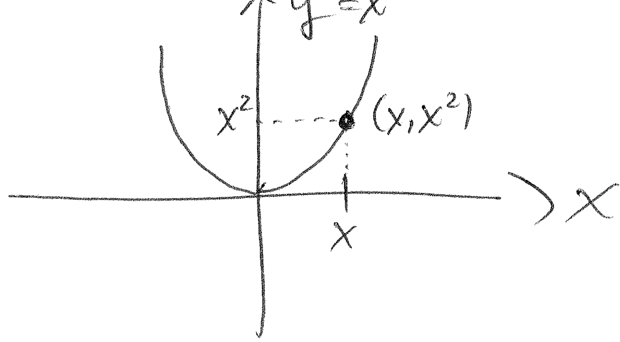
Which Equations Represent Functions?

Given an equation in two variables, y and x, say y depends on x, such as in $y = x^2$, then there is a relation which is a set of ordered pairs, $\{(x, y) \mid x \text{ is a valid input}\}$.

For $y = x^2$, we have the relation

$$\{(x, x^2) \mid x \text{ is a real number}\}.$$

This relation determines a graph, which you can draw on the x,y-plane, e.g.



Equations that Represent Functions

An equation in x and y defines y as a function of x if each value of x corresponds via the equation to exactly one value of y.

E.g.: $y = x^2$

y is a function of x because every value of x determines one value of y, namely $y = x^2$.

However, x is not a function of y.

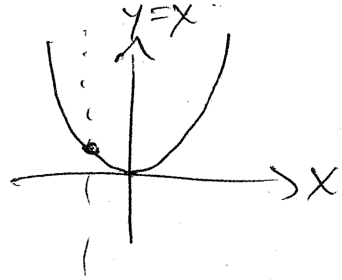
E.g.: $y = 9$. By the equation $y = x^2$, we have

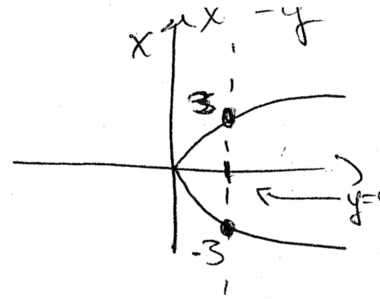
$$x^2 = 9.$$

$(-3)^2 = 9$ and $3^2 = 9$, so the value y determines two values for x.

Vertical Line Test

A graph of an equation is a function if and only if no vertical line intersects the graph in two places.





This passes the vertical line test, so $y=x^2$ is a function of x.

This fails the vertical line test, so $x^2=y$ is not a function of y.