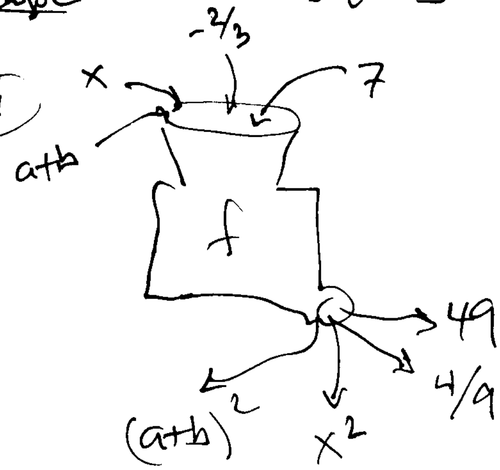
(Tue 26 Jan and) Thu 28 JAN 2016

MATH 121 - SPRING 2016

FIVE WAYS TO THINK ABOUT FUNCTIONS

1. Machine (that eats numbers, then spews out numbers)
2. Equation ($y = f(x)$)
3. Table (of ordered pairs)
4. Graph (that passes the ~~horizontal~~ vertical line test)
5. Mapping (from an x-number line to a y-number line)

Example: The squaring function

1. 

2. $f(x) = x^2$ OR $y = x^2$

$$f(7) = 7^2 = 49$$
$$f(a+b) = (a+b)^2 = a^2 + 2ab + b^2$$
$$f(t) = t^2$$

(3) Table

Domain of f →

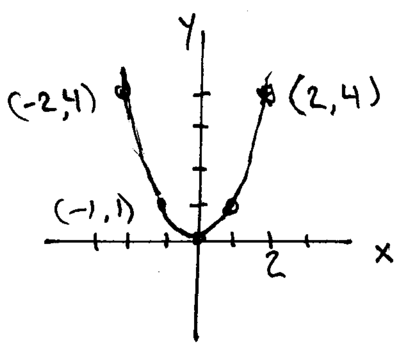
x	$y = x^2$
-2	4
-1	1
0	0
1	1
2	4
3	9

← Range of f

No repeated numbers in 1st column

(4) Graph

Passes the vertical line test

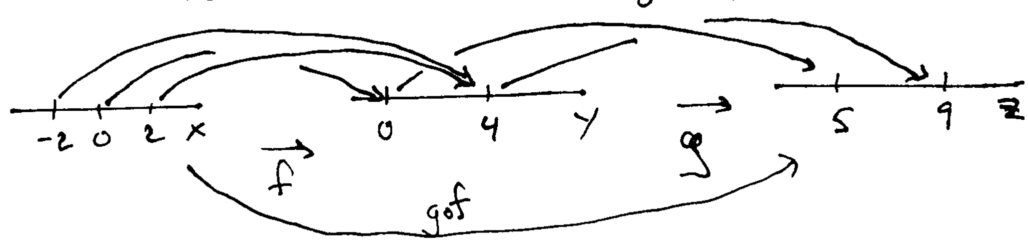


(5) Mapping

No arrows diverge.

example: In composition of functions

$f(x) = x^2$ $\qquad$ $g(y) = y + 5$



Practice with function notation

Suppose $f(x) = x^2 + 5x + 3$ defines some function

example 1: what is $f(x+2)$? (Simplify as much as possible.)

$$f(x+2) = (x+2)^2 + 5(x+2) + 3$$
$$= x^2 + 4x + 4 + 5x + 10 + 3$$
$$= x^2 + 9x + 17$$

Compare with

example 2: What is $f(x) + 2$?

$$f(x) + 2 = x^2 + 5x + 3 + 2$$
$$= x^2 + 5x + 5$$

In words:

ex1: Take x

(1) calculate $x+2$

(2) Then $f(x+2)$

Get $x^2 + 9x + 17$

ex2: Take x

(1) calculate $f(x)$

(2) then add 2

Get $x^2 + 5x + 5$

Moral: Most things in life are NOT commutative.

example: Putting on your socks and shoes has a different result from putting on your shoes and socks.

Quick survey of familiar functions

Polynomial functions

degree	example	name
0	$f(x) = 5$	constant function
1	$f(x) = 3x - 2$	linear function
2	$f(x) = x^2 + 5x + 3$	quadratic function
3	$f(x) = x^3 - 4x$	cubic function