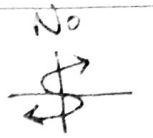
1.3 Function Notation

You have been hearing about functions for a good chunk of your math career, but do you actually know what a function is?

Mathematical Definition	Translation	What it looks like
A function is a relationship where each input has exactly one output.	When you plug something in, you get one answer.	Yes  No 

Here is what this looks like in terms of equations:

Equation	Function
$y = 2x - 5$	$f(x) = 2x - 5$
$y = x^2 - 3x + 10$	$f(x) = x^2 - 3x + 10$
For $y = 2x - 5$, find y when $x = 3$	For $f(x)$, find $f(3)$
For $y = 3x - 7$, find y when $x = -5$	For $f(x)$, find $f(-5)$

How do $f(x)$ and y relate to each other?

They are the same!

1) For $f(x) = 3x - 7$, evaluate the function for the following:

a. $f(-5)$

$3(-5) - 7$

$-15 - 7 = \boxed{-22}$

b. $f(7)$

$3(7) - 7$

$21 - 7 = \boxed{14}$

c. $f(0)$

$3(0) - 7$

$0 - 7 = \boxed{-7}$

2) For $f(x) = x^2 - 2x + 5$, evaluate the function for the following:

d. $f(-4)$

$(-4)^2 - 2(-4) + 5$

$16 + 8 + 5 = \boxed{29}$

e. $f(-1)$

$(-1)^2 - 2(-1) + 5$

$1 + 2 + 5 = \boxed{8}$

f. $f(6)$

$6^2 - 2(6) + 5$

$36 - 12 + 5 = \boxed{29}$

3) Graph the following functions.

g. $f(x) = 2x - 1$

h. $f(x) = -x + 3$

i. $f(x) = \frac{1}{2}x + 4$

Last time we talked about polynomial operations. We are going to build on that today with function operations.

Notation	What it means	What do you do?
$(f+g)(x)$	$f(x)+g(x)$	Add functions
$(f-g)(x)$	$f(x)-g(x)$	Subtract functions
$(f \cdot g)(x)$	$f(x) \cdot g(x)$	Multiply functions
$f(4x)$		Plug in expression for x

4) Given the functions below, evaluate each expression.

$f(x) = 2x + 4$ $\quad g(x) = x - 1$ $\quad h(x) = x^2$

a) $(f-g)(x)$

$(2x+4) - (x-1)$

$2x + 4 - x + 1$

$\boxed{x+5}$

b) $(f+h)(x)$

$(2x+4) + x^2$

$\boxed{x^2+2x+4}$

c) $(g+g)(x)$

$(x-1)+(x-1)$

$\boxed{2x-2}$

d) $(g \cdot h)(x)$

$(x-1)(x^2)$

$\boxed{x^3-x^2}$

d) $(h+g)(2)$

$= h(2)+g(2)$

$= (2)^2 + (2) - 1$

$= 4+2-1 = \boxed{5}$

e) $(f+f)(0)$

$= f(0) + f(0)$

$= 2(0)+4 + 2(0)+4$

$= 4+4 = \boxed{8}$

f) $(h-f)(4)$

$= h(4) - f(4)$

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

$= 16 - (8+4)$

$= 16 - 12 = \boxed{4}$

* Use parentheses around the entirety of what you subtract

g) $g(5x)$

$g(5x) = 5x - 1$

h) $h(x+1)$

$h(x+1) = (x+1)^2$

$= (x+1)(x+1)$

$= x^2 + 1x + 1x + 1$

$= \boxed{x^2+2x+1}$

i) $f(2x)+2$

$f(2x)+2 = (2(2x)+4)+2$

$= \boxed{4x+6}$