PreCalculus

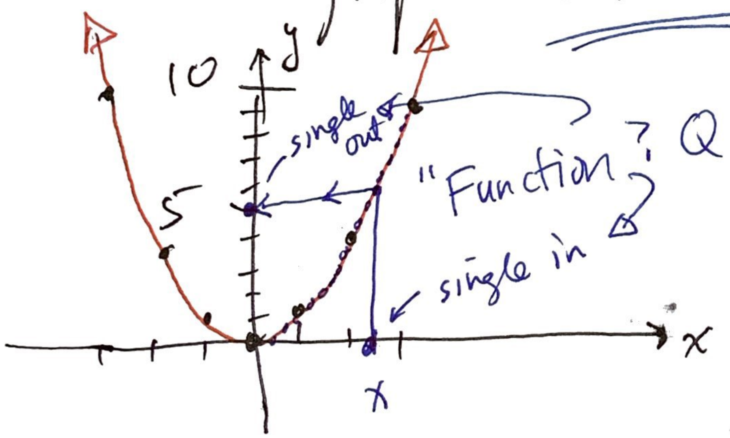
Chpt 1: Linear Functions and More

1.1 Functions

- Relationships "map" one item to another (or more)
- A function is a relation that has provides only a single output for each input.
- A one-to-one function is a function that yeilds one input for each output.

graphically: "analytical"

graph $f(x) = x^2$



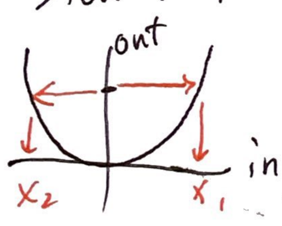
x	$y=f(x)=x^2$	(x,y)
−3	$(-3)^2 = 9$	(−3,9)
−2	$(-2)^2 = 4$	(−2,4)
−1	$(-1)^2 = 1$	(−1,1)
0	$0^2 = 0$	(0,0)
1	$1^2 = 1$	(1,1)
2	$2^2 = 4$	(2,4)
3	$3^2 = 9$	(3,9)

← discrete points

applies to continuous points

Q: 1-1 Function:

Start in reverse ...



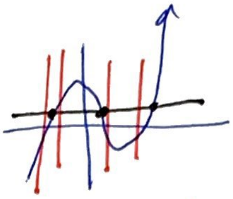
two inputs yeild the same output!!

$\boxed{\text{NOT 1-1}}$

* graphicall analysis

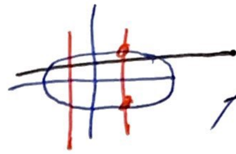
Q: which are functions?

"vertical line test"



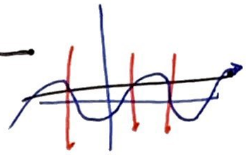
a function!

not 1-1



not a function

(not 1-1)



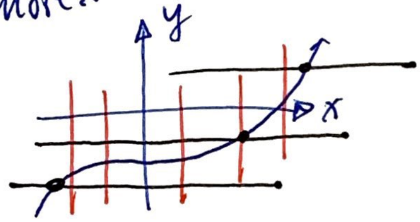
a function

not 1-1

Q: which are 1-1 functions?

"horizontal line test"

more..



Function

is 1-1 also

* Analytical analysis

$f(x) = -5x^2 + 2x - 1$

← place holder

Function notation

$f(\ ) = -5(\ )^2 + 2(\ ) - 1$

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

$= -20 + 4 - 1$

$= \boxed{-17}$

$f(x^3) = -5(x^3)^2 + 2(x^3) - 1$

$= \boxed{-5x^6 + 2x^3 - 1}$

$f(g(x)) = -5(g)^2 + 2(g) - 1$

$f(\Delta) = -5\Delta^2 + 2\Delta - 1$

Q: Is $f(x) = x^3$ a function?

↑ feed any # here and you will get one number out! $\boxed{\text{A function}}$

Q: $f(x) = \pm\sqrt{1-x}$

feed any # but you get two outputs $+$ $-$

$\boxed{\text{Not a function}}$

* Evaluation of functions

Ex: let $p(c) = c^2 + c$ ← $\boxed{p(\ ) = (\ )^2 + (\ )}$

(a) Find $p(-3)$

$$p(-3) = (-3)^2 + (-3)$$
$$= 9 - 3$$
$$= \boxed{6}$$

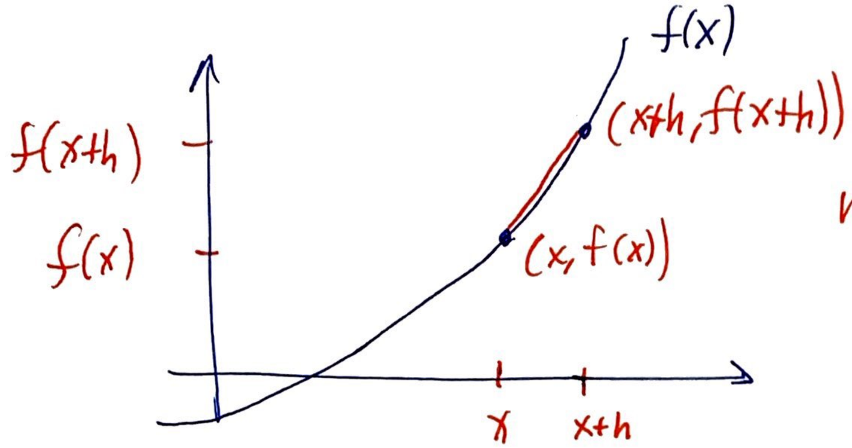
(b) $p(x+h)$

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

(c) Form $\dfrac{p(x+h) - p(x)}{h}$

$$= \frac{(\cancel{x^2} + x2h + \cancel{x} + h^2 + h) - (\cancel{x^2} + \cancel{x})}{h}$$

$$= 2x + 1 + h$$



$$m = \frac{\Delta y}{\Delta x} = \frac{f(x+h) - f(x)}{(x+h) - x}$$

$$= \boxed{\frac{f(x+h) - f(x)}{h}}$$

we let $h \to 0$:

$$\lim_{h \to 0} \left(\frac{f(x+h) - f(x)}{h} \right) = \text{tangent slope}$$

"instantaneous rate of change" also know as the derivative of $f(x)$.