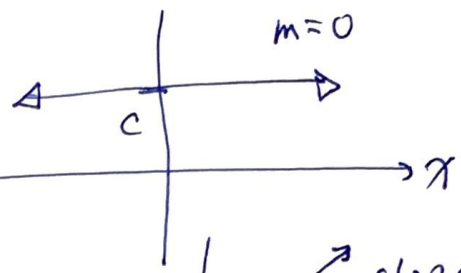
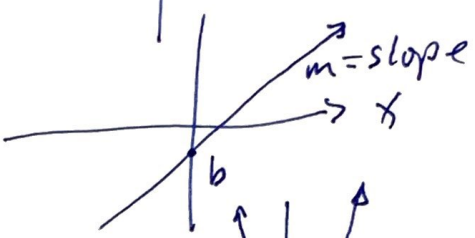
★ 1.1 review

Basic Functions

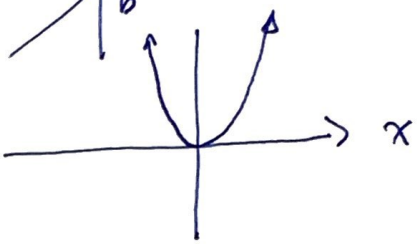
- $f(x) = c$
  "constant"



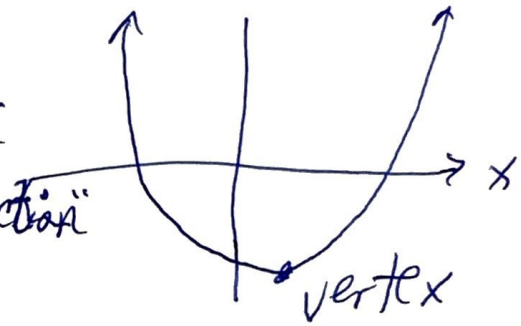
- $f(x) = mx + b$
  "line"



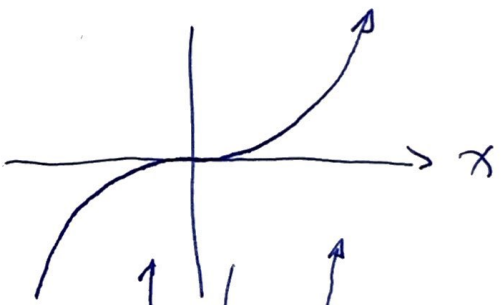
- $f(x) = x^2$
  "parabola"



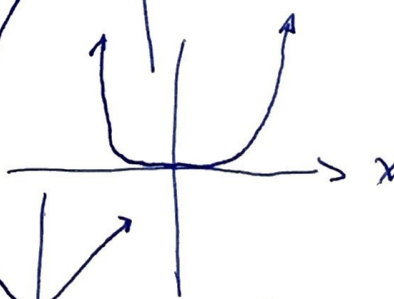
- $f(x) = ax^2 + bx + c$
  "quadratic function"



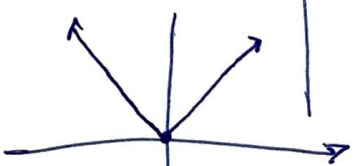
- $f(x) = x^3$
  "cubic"



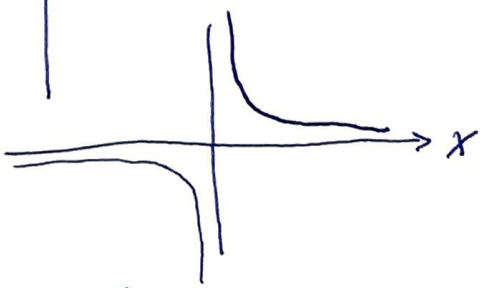
- $f(x) = x^4$
  "quadric"



- $f(x) = |x|$
  abs. value



- $f(x) = \frac{1}{x}$
  "reciprocal"



linear term

quadratic term

cubic term

quadric term

constant term

$$f(x) = ax^4 + bx^3 + cx^2 + dx + e$$

* functions: one out for each in
* 1-1 "one-to-one": one in for each out

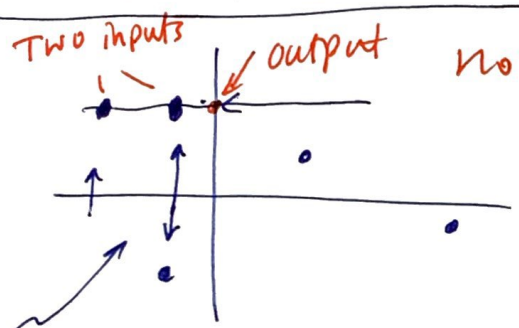
Ex #64

x	5	10	15
y	3	8	8

- each input (x), has only one output (y)
- each output (y) does NOT have only one input

So this is a function but not 1-1

Ex



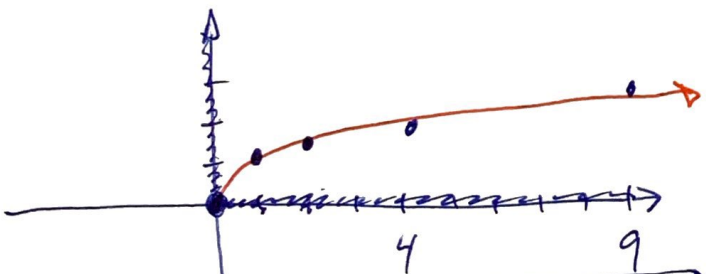
not 1-1 even if this "graph" was that of a function

not a function: two outputs for one input

* 1.2 Domain & Range

Ex $f(x) = \sqrt{x}$ (output ↙, input ↖)

- Domain is all allowable inputs
- Range is all resulting outputs corresponding to the domain inputs.



$D_f: \{x \mid x \geq 0\}$ "non-negative"

$R_f: \{y \mid y \geq 0\}$

x	$f(x) = y = \sqrt{x}$	(x, y)
-1	$\sqrt{-1}$ not real	*
0	$\sqrt{0} = 0$	(0, 0)
1	$\sqrt{1} = 1$	(1, 1)
2	$\sqrt{2} \approx 1.414$	
4	$\sqrt{4} = 2$	(4, 2)

*Analytical functions

EX Find the domain of $f(x) = 3\sqrt{x-2}$

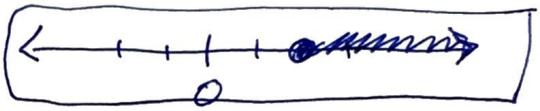
"all valid inputs"

$x - 2 \geq 0$ (+2)

- $x \geq 2$ algebraic notation
- $[2, \infty)$ interval notation
- $D_f : \{x \mid x \geq 2\}$ greater than or equal to

"ex" "such that" "ex"

- number line



EX $f(x) = \dfrac{x^2 - 9x}{x^2 - 81}$

$D_f = ?$ we must not ÷ by zero!

$x^2 - 81 \neq 0$

$x^2 = 81$

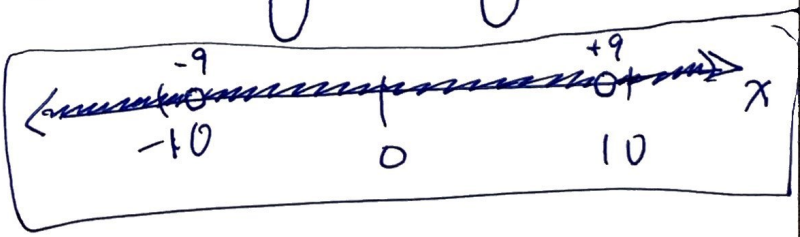
$x = \pm 9$

$D_f : \{x \mid x \neq \pm 9\}$

$(-\infty, -9)$ OR $(-9, 9)$ OR $(9, \infty)$

$\cup$ or $\cap$ and

$\cup$ $\cup$



note: lets factor

$$f(x) = \frac{x(x-9)}{(x+9)(x-9)} = \frac{x}{x+9}$$

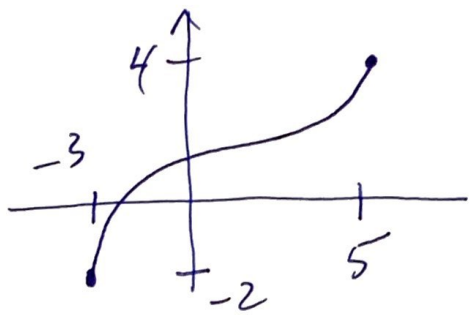
New function

$D_f : \{x \mid x \neq 9\}$

in calculus w/ limits...

* graphical functions domain & range

EX

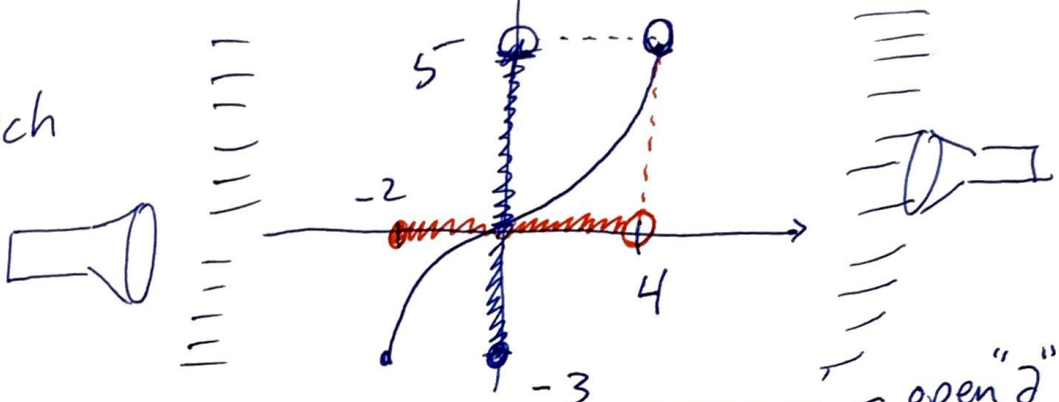


$D: \{x \mid -3 \le x \le 5\}$ "closed endpoints"

$R: \{y \mid -2 \le y \le 4\}$

Flash light Approach

EX

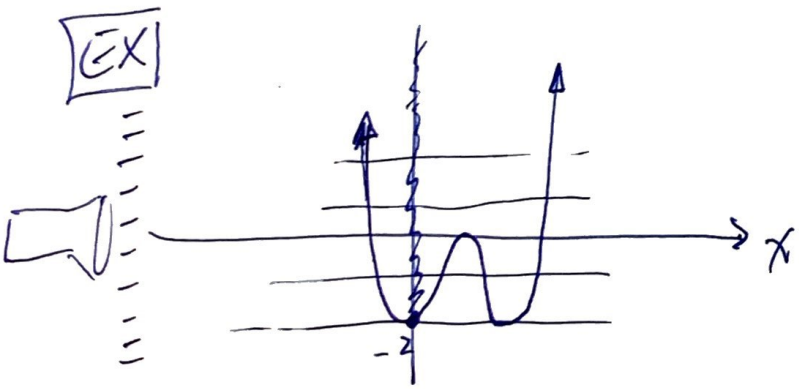


Range : $[-3, 5)$ — open "∂"

↑ closed "∂"

Domain : $[-2, 4)$

EX

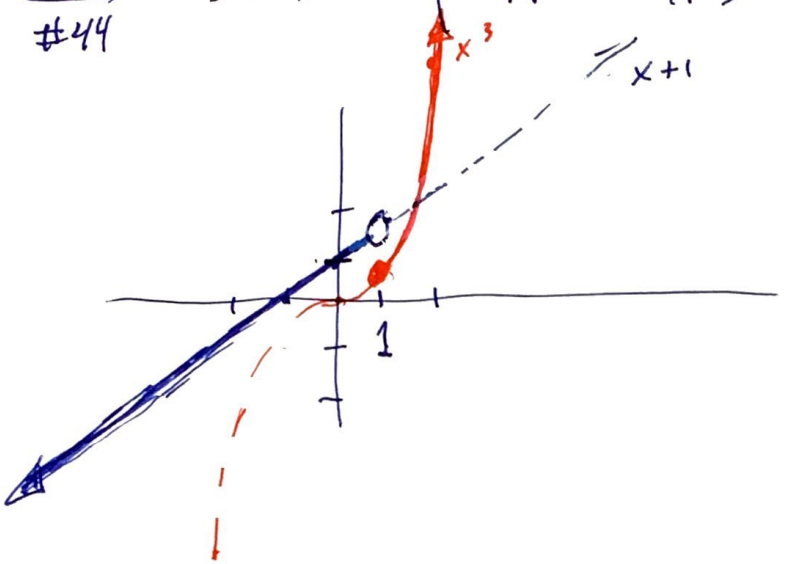


$D: (-\infty, \infty)$

$R: [-2, \infty)$

* piece wise function

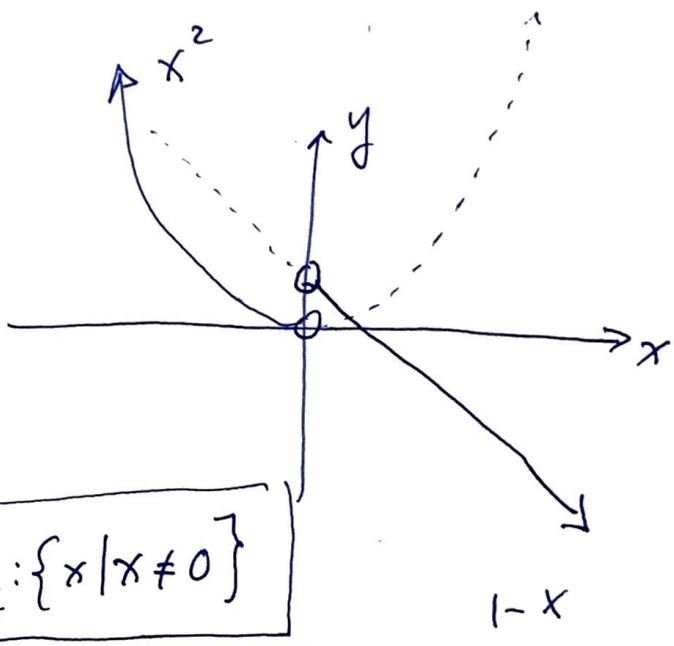
EX #44 $f(x) = \begin{cases} x+\frac{1}{3} & x<1 \\ x^3 & x \geq 1 \end{cases}$



$D_f: (-\infty, \infty)$

$R_f: (-\infty, \infty)$

EX $f(x) = \begin{cases} x^2 & x<0 \\ 1-x & x>0 \end{cases}$



$D_f: \{x \mid x \neq 0\}$

$R_f: \{y \mid y \in \mathbb{R}\}$ (all real numbers (element of