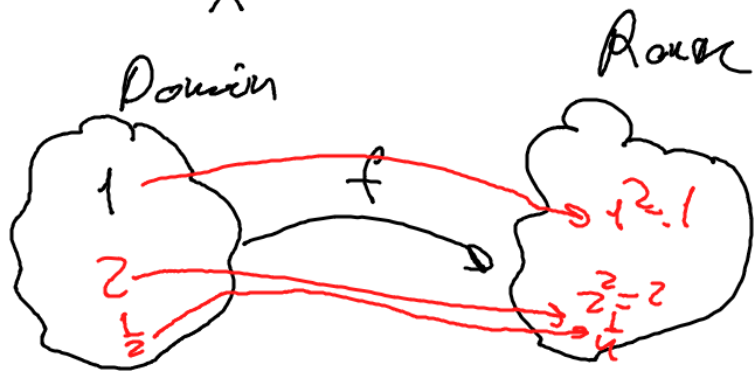


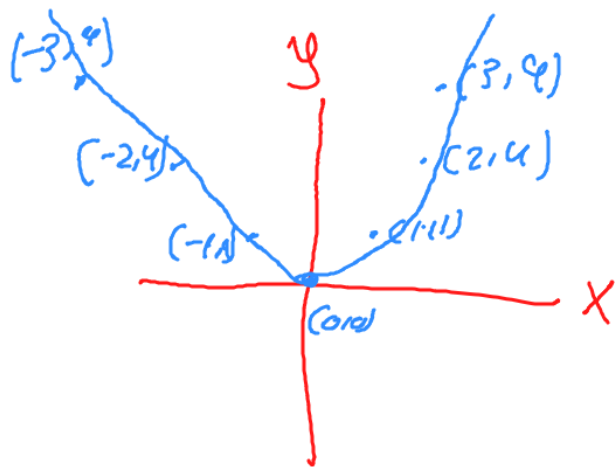
$$f(x) = x^2$$



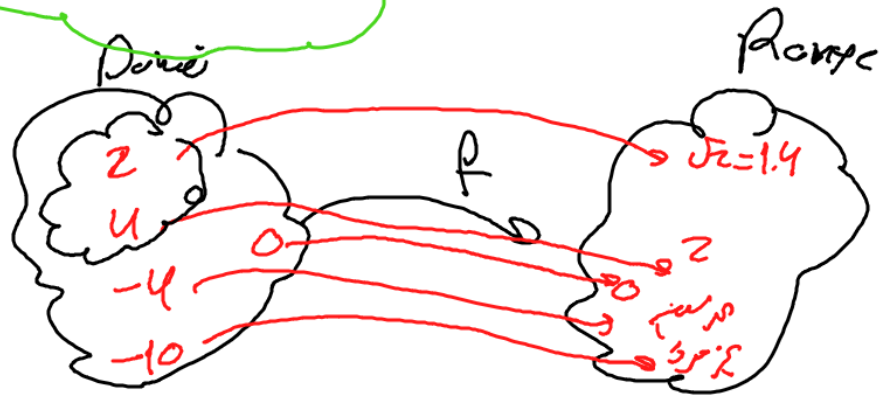
Domain  $\mathbb{R}$   
 $= \{x : x \in \mathbb{R}\}$

## Functions one variables

x	1	2	3	-1	-2
f(x)	1	4	9	1	4



1)  $f(x) = \sqrt{x}$



Domain  $\{x : x \geq 0\}$

2)  $f(x) = \sqrt{x+1}$

Domain  $= \{x : x+1 \geq 0\}$   
 $x \geq -1$

3)  $f(x) = \ln x$

مربعه  
مربعه

Domain  $= \{x : x > 0\}$

4)  $f(x) = \ln x + 3$

Domain  $= \{x : x + 3 > 0\}$

5)  $f(x) = \frac{1}{x+3}$

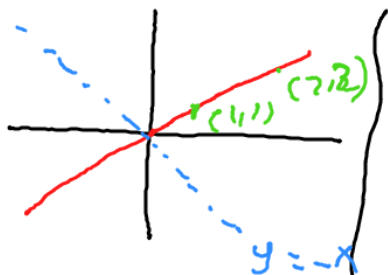
$x+3 \neq 0$   
 $x \neq -3$



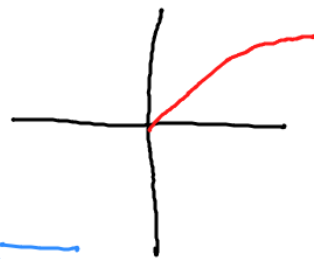
Domain  $\{x : x \neq -3\}$

- $\sqrt{9} = \pm 3$
- $\sqrt{4} = \pm 2$
- $\sqrt{-4} =$  غير معرف
- $\sqrt{0} = 0$
- $|\ln 1| = 0$
- $e^0 = 1$
- $e^{\square} = 0$
- $\ln 0 =$  غير معرف

$$f(x) = x$$



$$f(x) = \sqrt{x}$$



$$f(x) = -\sqrt{x}$$



$$f(x) = x^2$$



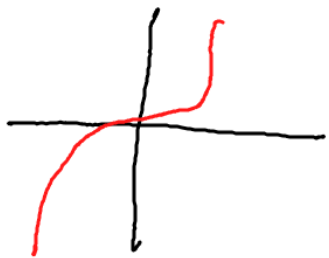
$$f(x) = e^x$$



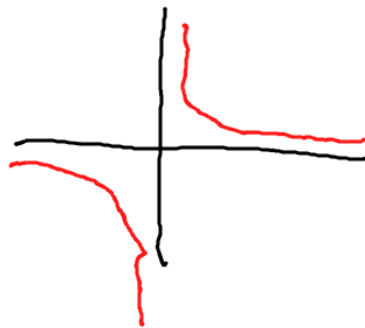
$$f(x) = -x^2$$



$$f(x) = x^3$$



$$f(x) = \frac{1}{x}$$



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



Q1 Sketch  $f(x) = x^2 + 1$  ?

$$y = x^2$$

$$f(x) = x^2$$



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



Q2 Sketch  $f(x) = x - 3$

$$f(x) = x$$



$$f(x) = x - 3$$



Q Skizze  $f(x) = \sqrt{x} + 2$

$$f(x) = \sqrt{x}$$



$$f(x) = \sqrt{x} + 2$$



$$f(x) = \sqrt{x} - 2$$



معادلة الازمة

$$(x - k)^2 + (y - h)^2 = r^2$$

$C = (k, h)$  /  $r =$  نصف القطر  
مركز الازمة

$$(x - 1)^2 + (y - 2)^2 = 4 = 2^2$$



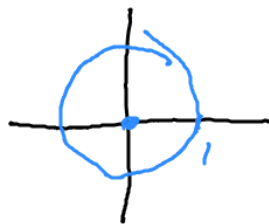
$$C = (1, 2)$$

$$r = 2$$

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

$$(x - 0)^2 + (y - 0)^2 = 1 = 1^2$$

$$C = (0, 0), r = 1$$



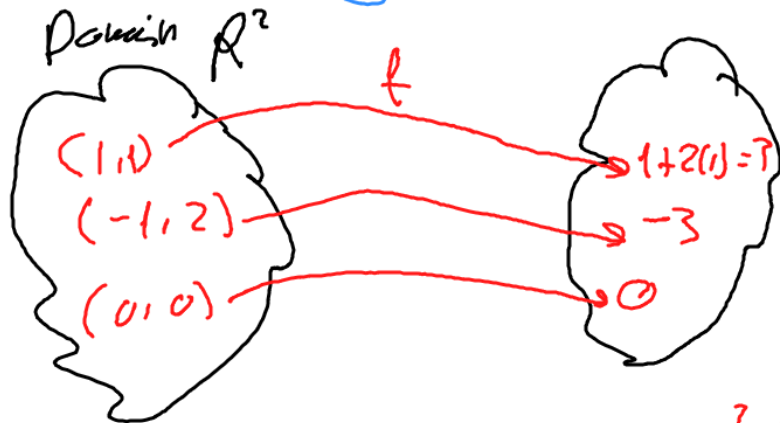
# Calculus?

## Function of two variables

$f(x,y) = z$

view  $z$

$$f(x,y) = x + 2y$$



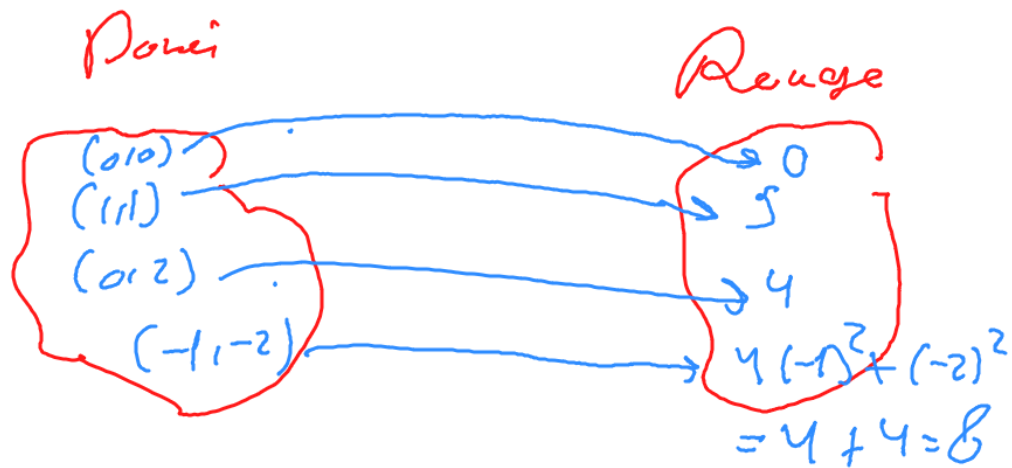
$$\text{Domain} = \{(x,y) : (x,y) \in \mathbb{R}^2\}$$

$\mathbb{R} \quad \mathbb{R}$   
 $\uparrow \quad \uparrow$   
 $(2,5) \in \mathbb{R}^2 = \mathbb{R} \times \mathbb{R}$   
 $(0,0) \in \mathbb{R}^2 = \mathbb{R} \times \mathbb{R}$   
 $(100,-100) \in \mathbb{R}^2$

$(-2,5) \in \mathbb{R}^2$   
 $(2,-7) \in \mathbb{R}^2$

Q:  $f(x, y) = 4x^2 + y^2$

Domain =  $\{(x, y) : (x, y) \in \mathbb{R}^2\}$



Range =  $f(x, y) \geq 0$



Ex 3: Find the domain of the following functions  
and evaluate  $f(3, 2)$ .

$$(a) f(x, y) = \frac{\sqrt{x+y+1}}{x-1} \quad f(3, 2) = \frac{\sqrt{3+2+1}}{3-1} = \frac{\sqrt{6}}{2}$$

Domain  $\{(x, y) : x+y+1 \geq 0 \text{ and } x \neq 1\}$

$$(b) f(x, y) = x \ln(y^2 - x)$$

Domain  $\{(x, y) : y^2 - x > 0\}$

$\rightarrow$  inf  $\bar{\emptyset}$   
nil  
no inf

$$f(3, 2) = 3 \ln(2^2 - 3) = 3 \ln(4 - 3) = 3 \ln 1 = 3 \cdot 0 = 0$$

Domain =  $\{(x,y) : x+y+1 \geq 0 \text{ and } x \neq 1\}$

$x+y+1 \geq 0$

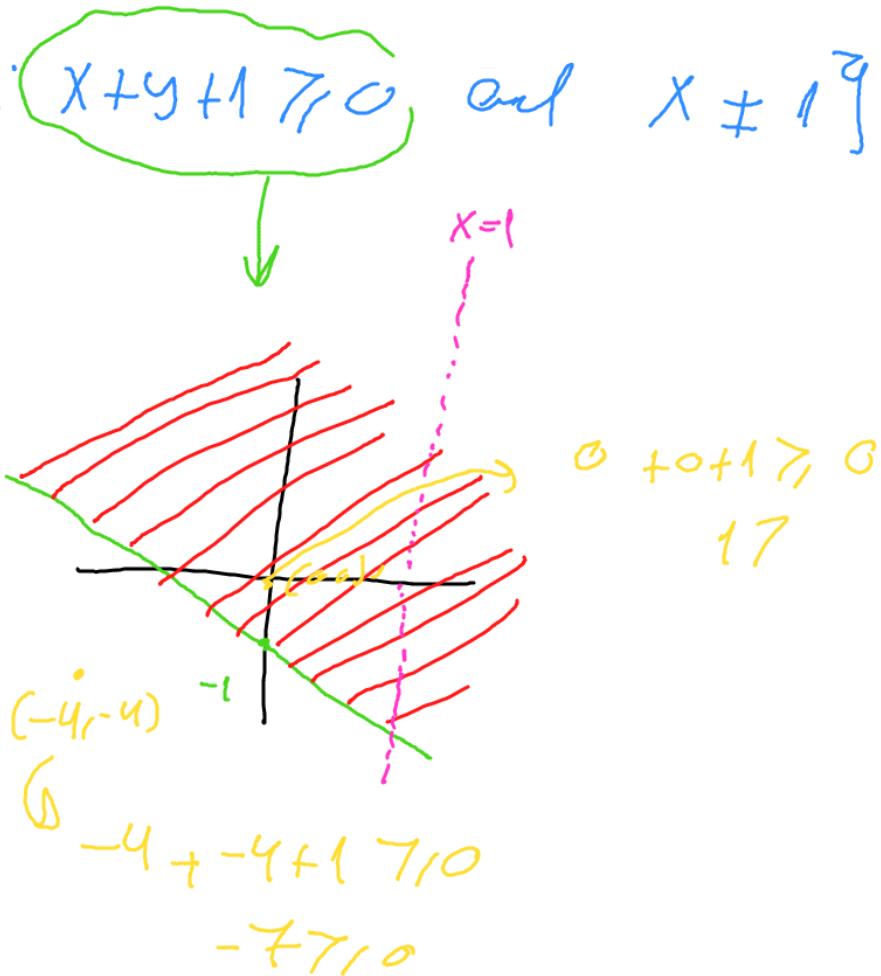
$y \geq -x-1$

$y = -x-1$

$y = x$

$y = -x$

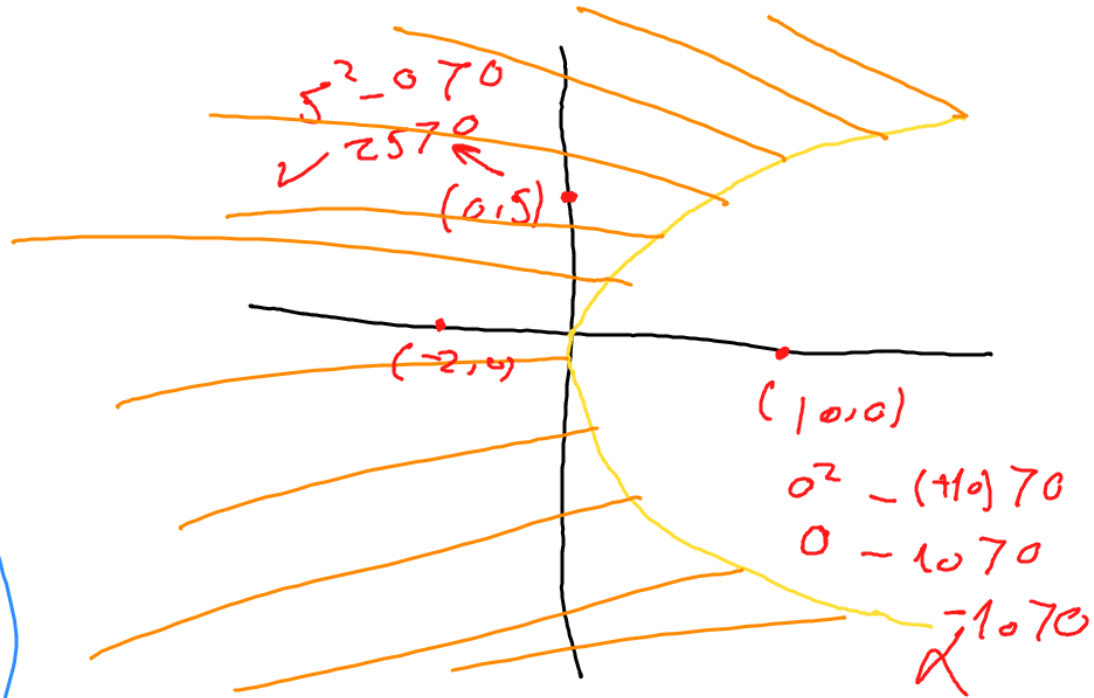
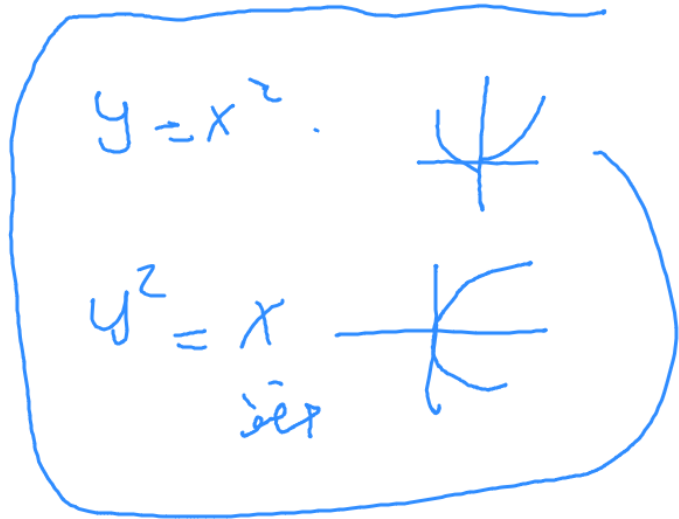
$y = -x-1$



$$(b) \text{ Domain} = \{(x, y) : y^2 - x > 0\}$$

$$y^2 - x > 0$$

$$y^2 > x$$



Ex: Find the domain

$$g(x, y) = \sqrt{9 - x^2 - y^2}$$

$$\text{Domain} = \{(x, y) : 9 - x^2 - y^2 \geq 0\}$$

$$9 - x^2 - y^2 \geq 0$$

$$9 \geq x^2 + y^2$$

$$x^2 + y^2 \leq 9 \rightarrow$$

$(0, 0)$   
 $C = (0, 0)$   
 $r = 3$



$$9 - 0^2 - 0^2 \geq 0$$

$$9 \geq 0 \quad \checkmark$$

