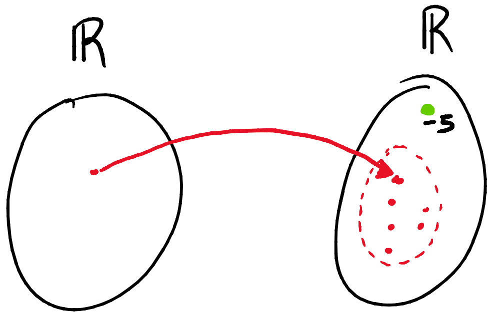
giovedì 9 marzo 2023 09:01

codomain

$$f : A \subseteq \mathbb{R}^n \longrightarrow \mathbb{R}$$

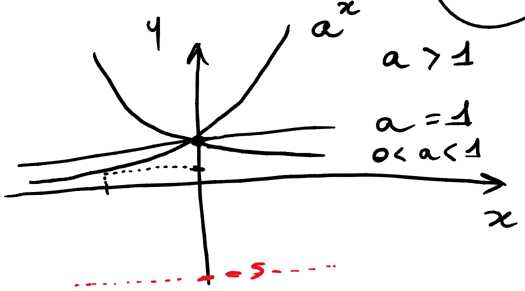
it is a rule that associates <u>each</u> element of $\underline{A}$ to a real number

domain



$$y = e^x$$

The domain is $\mathbb{R}$



$$\mathrm{Im}_f = \{ x \in \mathbb{R} : x > 0 \}$$

$$z = x^3 - y + 1$$

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

$$y = \sqrt{x}$$

domain: $\{ x \in \mathbb{R} : x \geq 0 \} =: \mathbb{R}_+$

natural logarithm (base e)

$$z = \ln(xy)$$

condition: $\underline{xy > 0}$

High school

$\log(\dots) = \log_{10}()$

$\ln(\ )$

University

$\log(\dots) = \ln$

$x > 0 \quad y > 0 \quad \checkmark$ region 1

$x > 0, \quad y > 0$ ✓ region 1 $\quad \log(\ldots) = 1$

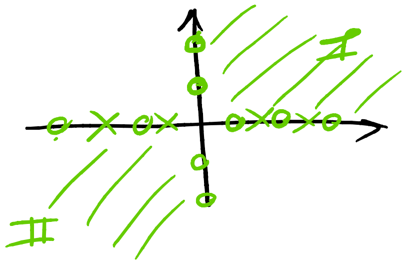
$x = 0, \quad y$ ✗

$x, \quad y = 0$ ✗

$x > 0, \quad y < 0$ ✗

$x < 0, \quad y > 0$ ✗

$x < 0, \quad y < 0$ ✓ region 2



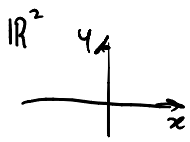
The demand function:

$$q_1 = f(p_1, p_2, y)$$

income

price of good 1 $\qquad$ price of good 2

quantity demanded for good 1



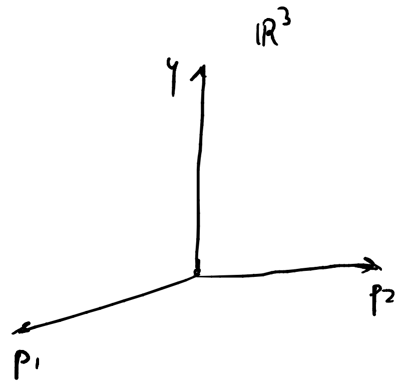
$p_1 \geq 0$

$p_2 \geq 0$

$y \geq 0$

$$\begin{pmatrix} p_1, & p_2, & y \\ \geq & \geq & \geq \\ 0 & 0 & 0 \end{pmatrix}$$

$\mathbb{R}^3_+$



$$\operatorname{dom} f = \{(p_1, p_2, y) \in \mathbb{R}^3 \mid p_1 \geq 0,\ p_2 \geq 0,\ y \geq 0\} =: \mathbb{R}^3_+$$

The utility function

The utility function

$$u = f(x_1, x_2, \dots, x_n)$$

quantity consumed of good 1

$$\operatorname{dom} f = \{(x_1, x_2, \dots, x_n) \in \mathbb{R}^n : x_1 \geq 0, \dots, x_n \geq 0\} =: \mathbb{R}^n_+$$

If x_i represents the level of satisfaction about good i, in this case $\operatorname{dom} f = \mathbb{R}^n$

The production function

$$y = f(x_1, x_2, \dots, x_n)$$

$x_1, x_2, \dots, x_n$ represent quantities of inputs used in the production process (capital, labour, etc...)

$\operatorname{dom} f = \mathbb{R}^n_+$ a priori

y: production level

In general the resources are limited so the domain is a set $A \subseteq \mathbb{R}^n_+$.

$A \subseteq \mathbb{R}^2$

$$z = \sqrt{2y - 4x}$$

How about if $x = 1$ and $y = 0$, we get $\sqrt{-4}$. This is not allowed

$$\sqrt{\dots}$$

$$\dots \geq 0$$

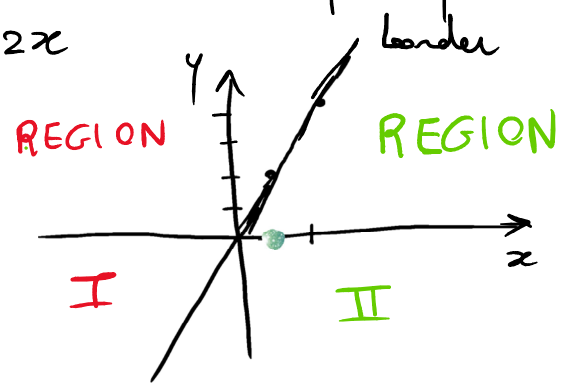
$$2y - 4x \geq 0$$

$$\frac{\cancel{2}y}{\cancel{2}} \geq \frac{\cancel{4}^{2}x}{\cancel{2}_{1}}$$

$$y \geq 2x$$

1) I represent the equality

$$y = 2x$$



The equality is the line

The inequality is either region I or II with the border

2) To decide which region to select, I choose a point that does not lie on the border, for example (1, 0).

Then I substitute the coordinates of this point into the original inequality

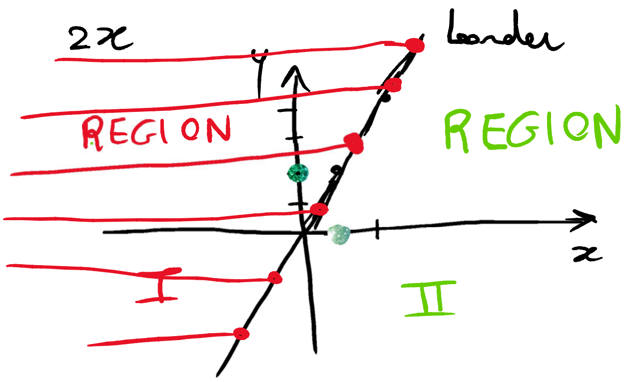
$$y \geq 2x$$

$$0 \geq 2 \cdot 1$$

$0 \geq 2$ This is not true.

So the correct region is the one such that

So the correct region is the one such that the test point we selected does not belong to that region



If we had chosen $(0, 2)$

$$y \geq 2x$$

$$2 \geq 2 \cdot 0$$

$$2 \geq 0$$

correct so the new test point lies on the correct region.

$$\infty$$

$$z = \sqrt{9 - (x^2 + y^2)} + \sqrt{y^2 - y - 2}$$