

# Linear solver with infinity numbers (Linsol)

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# Introduction



The project is separated in two parts:

- Infinity numbers
- Linsol (linear solver  $\rightarrow$  simplex)



# Infinity numbers

## Definition

Infinity number is a pair of real numbers. The one is for the real part and the other is for the infinity part.

$$(a; b) = a + b\infty, \text{ where } a \in \mathbb{R}, b \in \{-1, 0, 1\}$$

# Infinity numbers

## Comparison

- If the infinity part of the number is  $> 1$  the number is  $= \infty$
- If the infinity part of the number is  $> -1$  the number is  $= -\infty$
- $\infty = \infty$  and  $-\infty = -\infty$
- If the infinity parts of the both numbers are  $=0$  then we compare the real parts as normal  $\mathbb{R}$

*Note: If the infinity part of the number  $\notin \{-1, 0, 1\}$  we get it to one of these values*

# Infinity numbers

## Math operations

$$(a; b) \pm (c; d) = (a \pm c; b \pm d)$$

$$(a; b) \times (c; d) = (ac; ad + bc + bd)$$

$$\frac{(a; b)}{(c; d)} = \begin{cases} (\frac{b}{d}; 0) & d \neq 0 \\ (\frac{a}{c}; \frac{b}{c}) & d = 0 \end{cases}$$

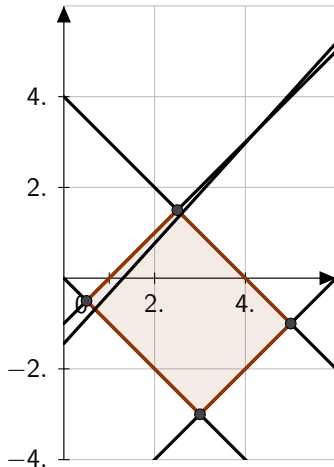
*Note: If the infinity part of the number  $\notin \{-1, 0, 1\}$  we get it to one of these values*

# Simplex

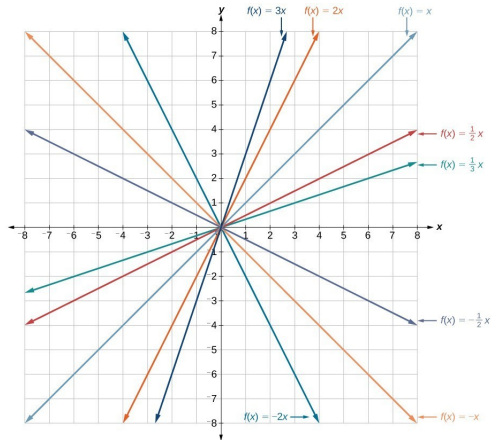
## Definition

The simplex method is an algorithm for finding minimum/maximum value of a linear function with given linear constraints.

- Finds the figure of intersection of the graphics of the constraints.
- Loop all of the vertices and find where the target function's value is optimal



**Linsol** is a library written in Rust, which implements the simplex algorithm.



- Clarify the conception of the infinity numbers
- Make the code working
- Improve the memory consumption
- Improve the speed
- Implement integer solving

**{code}YOURFUTURE**



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- *Rust compiler toolchain*: <https://www.rust-lang.org>.  
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# Questions





**THANK YOU**  
for your  
**ATTENTION!**