

Complex Analysis - Part 1

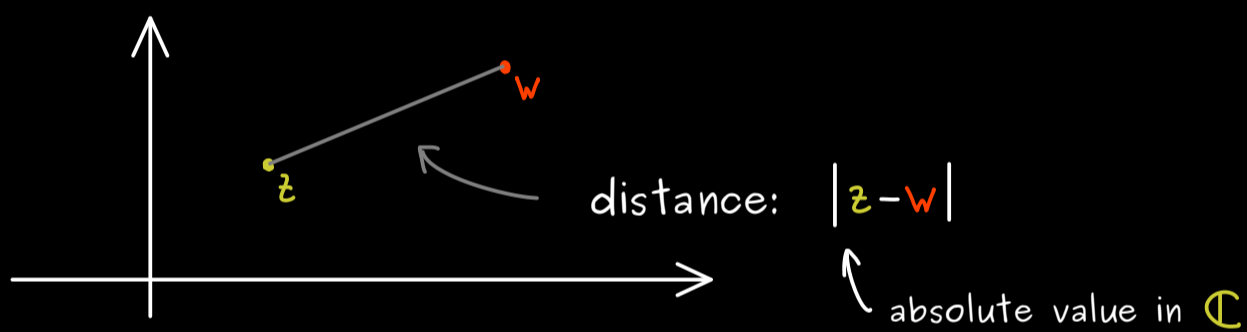
analysis of differentiable functions $f: \mathbb{C} \rightarrow \mathbb{C}$
(instead of $f: \mathbb{R} \rightarrow \mathbb{R}$)

$\mathbb{R} \subseteq \mathbb{C} \Rightarrow$ helpful for real problems like $\int_{-\infty}^{\infty} \frac{x \cdot \sin(x)}{1+x^2} dx = \frac{\pi}{e}$

- We need:
- sets
 - complex numbers
 - basic knowledge of continuous and differentiable functions
 - basic knowledge of power series
- Start Learning Mathematics
- Real Analysis (some videos)

Some definitions:

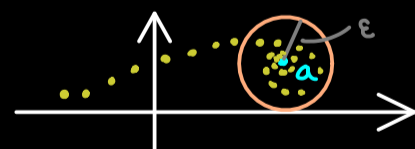
\mathbb{C} is a set with a distance (metric space)



A sequence $(z_n)_{n \in \mathbb{N}} \subseteq \mathbb{C}$ is convergent to $a \in \mathbb{C}$

$\Leftrightarrow (|z_n - a|)_{n \in \mathbb{N}} \subseteq \mathbb{R}$ is convergent to 0

$\Leftrightarrow \forall \epsilon > 0 \exists N \in \mathbb{N} \forall n \geq N : |z_n - a| < \epsilon$



ϵ -ball: $\mathcal{B}_\epsilon(a) := \{w \in \mathbb{C} \mid |w - a| < \epsilon\}$

A function $f: \mathbb{C} \rightarrow \mathbb{C}$ is continuous at $z_0 \in \mathbb{C}$ if for all sequences $(z_n)_{n \in \mathbb{N}} \subseteq \mathbb{C}$:

$z_n \xrightarrow{n \rightarrow \infty} z_0$ implies $f(z_n) \xrightarrow{n \rightarrow \infty} f(z_0)$.

\uparrow means: $(z_n)_{n \in \mathbb{N}}$ is convergent to z_0