D1.1.1: Complex numbers

L1.1.3

properties of complex numbers

Remark

$\mathbb{C}$ is a field.

D1.1.5 and D1.1.7

polar and exp forms

L1.1.6

de moivre

L1.1.9

conjugate properties

L1.1.10 – 11: Triangle inequalities

D1.1.12: Argument of z

P1.1.14

properties of arg z

Remark

set addition

D1.2.1: Open and closed ϵ-discs

Let $z_0 \in \mathbb{C}$ and $\epsilon > 0$.

1. An **open** ϵ-disc centred at z_0 is:
$$D_\epsilon(z_0) := \{z \in \mathbb{C} : |z - z_0| < \epsilon\}.$$
2. A **closed** ϵ-disc centred at z_0 is:
$$\overline{D}_\epsilon(z_0) := \{z \in \mathbb{C} : |z - z_0| \leq \epsilon\}.$$

A **punctured** ϵ-disc centred at z_0 is:
$$D'_\epsilon(z_0) := \{z \in \mathbb{C} : 0 < |z - z_0| < \epsilon\}.$$

D1.2.2: Open sets

Let $U \subset \mathbb{C}$. Set U is **open** if:
$$\forall z_0 \in U; \exists \epsilon > 0 : D_\epsilon(z_0) \subseteq U.$$

Subset F is **closed** if $\mathbb{C} \setminus F$ is open.

A **neighbourhood** of point $z_0 \in \mathbb{C}$ is an open set that contains z_0.

L1.2.3

Punctured disc $D'_\epsilon(z_0)$ is open.

D1.2.4: Limit points

Let $S \subseteq \mathbb{C}$. z_0 is a **limit point** of S if:
$$\forall \epsilon > 0; D'_\epsilon(z_0) \cap S \neq \emptyset.$$

The **closure** of S is set $\overline{S}$ and contains S and **all** its limit points.

L1.2.6

Let $S \subseteq \mathbb{C}$. S is closed **iff** $S = \overline{S}$.

D1.2.7: Bounded sets

Remark

include bounded sequence (D1.2.14)

D1.2.8: ϵ-N convergence

L1.2.9

L1.2.10

D1.2.11: Cauchy sequences

L1.2.12

seq conv iff cauchy

L1.2.15: Bolzano-Weierstrass

Remark

define a complex valued function

D1.3.1: Bounded functions

D1.3.2: ϵ-δ convergence

L1.3.3 ?

L1.3.4

results on function limits

L1.3.5

limit algebra

D1.3.6: ϵ-δ continuity

L1.3.7

L1.3.8

composition of functions are also continuous

L1.3.9

L1.3.10