Lecture 4: Argand Diagram. Polar Forms

Aim Lecture Though complex numbers don't represent quantities they can

Argand Diagram

Represent the complex number $z =$

e.g. i has coords

Geom interpretation of addn

e.g. $z = 1 + i, w = 2 + i$.

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See $z + w$ corresponds to

(more in later lectures)

For now just note $0, z, w, z+w$ form vertices

Polar Form Points in the plane can be described in polar coords and hence

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Defn The modulus of z is

The argument of z (for $z \neq 0$) is

N.B. $\tan\theta =$

so

e.g. $|3 + 4i| =$

$|-\pi i|$

$\operatorname{Arg} -3i$

$\operatorname{Arg} 3 + 4i$

Arg $-1 - i$

N.B. r & θ determine z. In fact, trig $\implies$

Formulae $Rez =$

Hence

$z = r$

This called the polar

e.g. What complex number has modulus 2 & argument $-\frac{\pi}{3}$?

Plotting regions in the complex plane

e.g. Plot the points on the Argand diagram where $-\frac{\pi}{2} \leq \operatorname{Arg} z <$

For more interesting examples need

Shifting Interpret geom $|z-w|$&

e.g. Plot the regions defined by

a) $|z-1+i| \geq \sqrt{2}$, b) $\text{Arg}(z-1+i) >$

c) $|z-1+i| \geq \sqrt{2}$ & $\text{Arg}(z-1+i) >$

cont'd

e.g. Sketch the set

$$\{z \in \mathbb{C} \,||z - 2 - i| = 1, \text{or } Rez > 2\}$$