MATH425 Lecture 2

Chris Camano: ccamano@sfsu.edu

2/1/2022

1 Complex numbers - Plotting

imaginary numbers can be plotted on an extension of $\mathbb{R}$ analagous to the cartesian plane in which an imaginary axis extends out from $\mathbb{R}$.

Complex numbers can also be plotted using polar coordinates with the length of r as the absolute value of some complex number Z

$$r = |z| = \sqrt{x^2 + y^2}$$

Also represented as :

$$z = x + iy = r(cos(\theta) + isin(\theta)) = re^{i\theta}$$

1.1 Example

Convert 1+i to a polar form
Convert $z = e^{i\pi/2}$to z=a+bi
Find e$^{\pi i} + 1$

$$1 + i = \sqrt{2}e^{i\pi/4} = (\sqrt{2}, \frac{\pi}{4})$$
$$z = e^{i\pi/2} = cos(\frac{\pi}{2}) + sin(\frac{\pi}{2})i$$
$$e^{\pi i} + 1 = 0$$

2 Rotating a complex numbers by τ radians

Let f be the function that rotates $z = re^{i\theta}$ by τ counter clockwise.

$$f(z) = re^{i(\theta+\tau)} = ze^{i\tau}$$
$$\int_a^b \frac{x^2}{\sqrt{x^2+1}}dx$$