

Lesson 1 Notes (May 25, 2022)

Complex Numbers

To “realize” a fraction, multiply it by its conjugate:

The conjugate of a complex number: $a+bi$ is $a-bi$. Multiple the fraction by $(a-bi)/(a-bi)$.

Notation: $z = a+bi$ ($a, b =$ any real number) $\text{Re}(z) = a \rightarrow$ real part $\text{Im}(z) = b \rightarrow$ imaginary part

Absolute Value (modulus): The “value” of the vector that is the imaginary number on the Argand plane (imaginary plane - $\text{Re: } x$ ($a=x$), $\text{Im: } (b=y)$)

Modulus/Absolute Value = $\sqrt{\text{Re}(z)^2 + \text{Im}(z)^2}$

Laws:

$$\bar{\bar{z}} = z \quad (1)$$

$$\overline{z_1 \pm z_2} = \bar{z}_1 \pm \bar{z}_2 \quad (2)$$

$$\overline{z_1 * z_2} = \bar{z}_1 * \bar{z}_2 \quad (3)$$

$$\frac{\bar{z}_1}{z_2} = \frac{\bar{\bar{z}_1}}{\bar{z}_2} \quad (4)$$

$$| \bar{z} | = | z | \quad (5)$$

$$z * \bar{z} = | z |^2 \quad (6)$$

$$\frac{1}{z} = \frac{\bar{z}}{| z |^2} \quad (7)$$

Homework for Laws: Prove each law.

Notes:

- Real, and natural numbers are subsets of complex numbers where $b=0$ (only a).
- Complex Numbers are the last set of numbers (for normal people) as any number can be written in complex form ($a+bi$)