Week-02

Complex Number, Set

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Today Agenda

1. Complex Numbers
   - Visuals of Complex Number
   - Mathematical Operations
2. Sets

Complex Numbers

Complex Numbers

We recall the previous lecture where we have define the complex numbers. In this lecture more deep into mathematical operations graphical visual.

Definition

A complex number is a number of the form $a + bi$, where a and b are real numbers, and i is an indeterminate satisfying $i^2 = -1$. For example, $2 + 3i$ is a complex number.

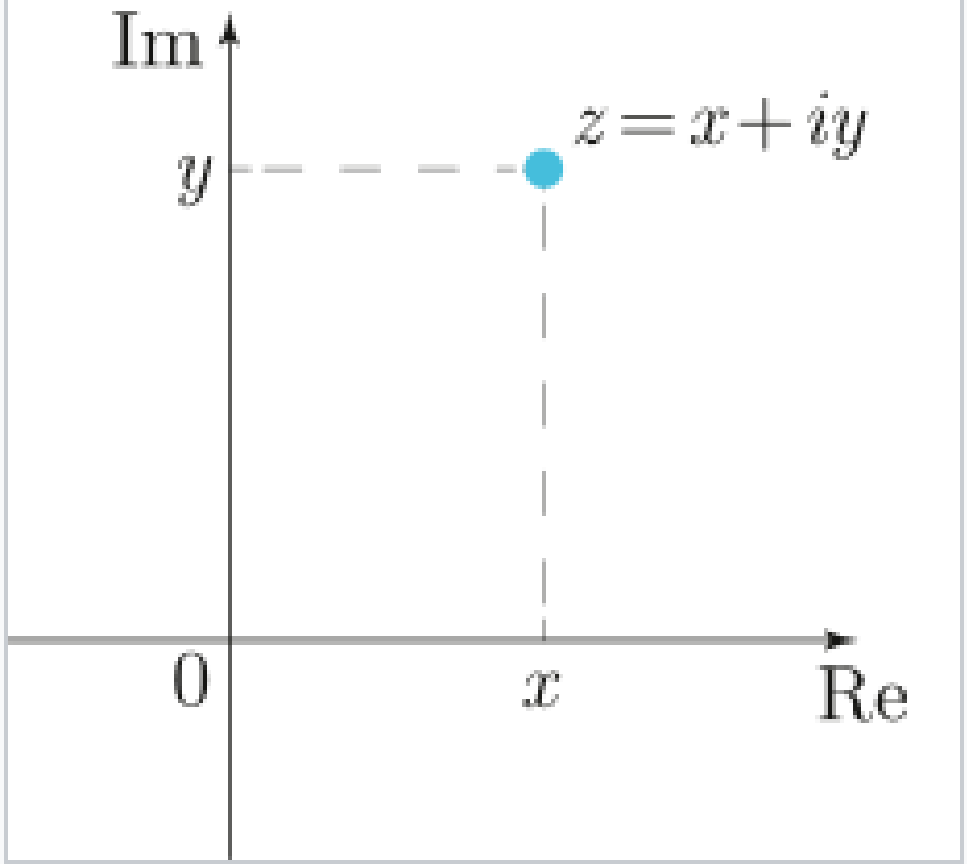
Note

$i = \sqrt{-1}$
$i^2 = -1$
$i^3 = -i$
$i^4 = 1$

Definition

A number of the form $a\sqrt{-1} = ai$ is a pure imaginary number where a is a non-zero real number

Visuals of Complex Number



An illustration of the complex number $z = x + iy$ on the complex plane. The real part is x, and its imaginary part is y.

Mathematical Operations

- Addition and subtraction

Example

$z = a + bi, w = c + di$
$z \pm w = (a + bi) \pm (c + di)$
$= (a \pm c) + (b \pm d)i$

Note

The sum of two complex numbers is always a complex number. That sum may be an element of one of the subsets of the complex numbers, that is, a real number or a pure imaginary number

- Multiplication and square

Example

$z = a + bi, w = c + di, z \times w = (a + bi) \times (c + di) = ac + adi + bci + bdi^2$
$= ac - bd + (ad + bc)i$
$z^2 = (a + bi)^2, = a^2 + abi + bi^2$
$= a^2 - b^2 + abi$

Mathematical Operations

- Reciprocal and division

Example

Complex Numbers and its Conjugate is write as $\bar{z} = a - bi$

Reciprocal!

$\frac{1}{z} = \frac{\bar{z}}{z\bar{z}}$

$= \frac{a}{a^2+b^2} - \frac{b}{a^2+b^2}i$

division!

$\frac{w}{z} = w \times \frac{1}{z} = c + di \times (\frac{a}{a^2+b^2} - \frac{b}{a^2+b^2}i)$

Identity

* The additive identity of the complex numbers is the real number $(0 + 0i)$ or 0
* The additive inverse of any complex number $(a + bi)$ is $(-a - bi)$.

Addition and subtraction

1. Find the sum of $\sqrt{-25} + \sqrt{-49}$

.....

2. Find the subtraction $\sqrt{-25}$ - $\sqrt{-49}$

.....

3. $(5 + 3i) - (2 + 8i)$

.....

4. $(7 + 4i) - (-1 + 3i)$

Multiplication and square

1. Find the sum of $\sqrt{-25} + \sqrt{-49}$
2. Find the subtraction $\sqrt{-25}$ - $\sqrt{-49}$

Reciprocal and division

Sets

Sets

Definition

A set is the mathematical model for a collection of different[1] things;[2][3][4] a set contains elements or members, which can be mathematical objects of any kind: numbers, symbols, points in space, lines, other geometrical shapes, variables, or even other sets

Example

School bag, have different set for things.

Thank you!