

COMPLEX NUMBERS ARITHMETIC

Standard Form: $z = a + bi$

Let $z_1 = a + bi$ and $z_2 = c + di$, where $i^2 = -1$

Operation	Algebraic Rule	Example
Addition	$(a + c) + (b + d)i$	$(3+2i) + (1+4i) = 4 + 6i$
Subtraction	$(a - c) + (b - d)i$	$(5+7i) - (2+3i) = 3 + 4i$
Multiplication	$(ac - bd) + (ad + bc)i$	$(2+3i)(1+2i) = -4 + 7i$
Conjugate	$z^* = a - bi$	If $z = 4+5i$, then $z^* = 4-5i$
Division	$\left[\frac{(ac+bd)}{(c^2+d^2)} + \frac{(bc-ad)}{(c^2+d^2)}i \right]$	Multiply numerator/denominator by conjugate of divisor

Powers of i

- $i^1 = i$
- $i^2 = -1$
- $i^3 = -i$
- $i^4 = 1$

Absolute Value (Modulus)

$$|z| = \sqrt{a^2 + b^2}$$

Represents distance from origin (0,0) in the complex plane.