Example:

Consider the complex number $z = 3 + 4i$

The complex conjugate $\dot{z} = 3 - 4i$

Arithmetic Operations:

Arithmetic operations can perform on complex numbers, including addition, subtraction, multiplication, and division. These operations follow certain rules based on the properties of real and imaginary numbers.

Addition and Subtraction:

To add or subtract complex numbers, add or subtract their real and imaginary parts separately.

Addition

Consider complex number $Z_1 = a_1 + b_{1}i$ $Z_2 = a_2 + b_{2}i$ on addition

$Z1 + Z2 = (a1 + b1i) + (a2 + b2i) = (a1 + a2) + (b1 + b2)i$

Subtraction

$Z1 - Z2 = (a1 + b1i) - (a2 + b2i) = (a1 - a2) + (b1 - b2)i$

Addition

Example:

$(2 + 3i) + (4 - 2i)$

Solution

$(2 + 3i) + (4 - 2i) = (2+4) + (3 - 2)i$

$= 6 + i$ Ans.

Subtraction

Example:

$(2 + 3i) - (4 - 2i)$

Solution

$(2 + 3i) - (4 - 2i) = 2 + 3i - 4 + 2i = (2-4)+(3+2)i$

$= -2 + 5i$ Ans

Multiplication:

To multiply complex numbers

$Z_1 = (a + bi)$ and $Z_2 = (c + di)$, use the distributive property and simplify.

Solution

$Z_1 * Z_2 = (a + bi) * (c + di) = a(c + di) + bi(c + di)$

$= ac+adi + bci + bdi^2$ it is evident that $i^2 = -1$

$= ac+adi + bci + bd(-1)$

$= ac+adi + bci - bd = (ac - bd) + (ad +bc)i \rightarrow (1)$

$Z_1 = (2 + i)$ $Z_2 = (3 - 2i)$ Simplify $Z_1 * Z_2$

Solution

$Z_1 * Z_2 = (2 + i) * (3 - 2i) = 2*(3 - 2i) + i*(3 - 2i)$