COMPLEX NUMBERS. 1

$i = \sqrt{-1} = i$

$\sqrt{-4} = \sqrt{-1 \cdot 4} = \sqrt{-1} \cdot \sqrt{4} = \sqrt{-1} \cdot 2 = 2i$

$\sqrt{-36} =$

$\sqrt{-64} =$

$\sqrt{-2} =$

$i^2 = i \cdot i = \sqrt{-1} \cdot \sqrt{-1} = -1$

$i^3 =$

$i^4 =$

$i^5 =$

$i^6 =$

$i^7 =$

$i^8 =$

Plot on an Argand Diagram: $1 + 2i, \quad 2 - 3i, \quad 2$

Solve the following equations, indicating the solutions on an Argand Diagram.

1. $x^2 + 4x + 13 = 0$
2. $x^2 + 3x + 2 = 0$
3. $2x^2 + 3x + 5 = 0$
4. $x^2 + 3 = 0$

SUBTRACTION

$(a + bi) + (c + di) = (a + c) + (b + d)i$

$(2 + 3i) + (1 + i) =$

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

$(2 + 5i) - (2 - 3i) =$

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

AND ON AN ARGAND DIAGRAM

$(4 + 3i) + (2 + 7i)$

$(9 + 5i) - (2 + 3i)$

$(9 + 5i) + (-2 - 3i)$

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

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

MULTIPLICATION

$(a+bi)\cdot(c+di)=(ac-bd)+(ad+bc)i$

$(2+3i)\ (3-5i)=$

$(5+2i)\ (4-5i)=$

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

$(4+3i)\ (3+4i)=$

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

The Complex Conjugate

$z=a+bi,\quad \overline{z}=a-bi,\quad z\,\overline{z}=a^2+b^2$

$z=-3+4i,\quad \overline{z}=$

$z=3-4i,\quad \overline{z}=$

$z=2i,\quad \overline{z}=$

$z=3,\quad \overline{z}=$

$z=2+3i,\quad z\,\overline{z}=$

$z=-3-4i,\quad z\,\overline{z}=$

$z=2,\quad z\,\overline{z}=$

$z=-3i,\quad z\,\overline{z}=$

DIVISION

$$\frac{A+Bi}{C}=\frac{A}{C}+\frac{B}{C}i=a+bi$$

$$(a+bi)\ /\ (c+di)=\frac{(a+bi)}{(c+di)}=\frac{(a+bi)}{(c+di)}\cdot 1=\frac{(a+bi)}{(c+di)}\cdot\frac{(c-di)}{(c-di)}=\cdots$$

$$\frac{(3+2i)}{(4+5i)}=$$

EXERCISE

Plot on an Argand Diagram:

$$\frac{(8+7i)}{(5+2i)}$$

$$\frac{(4+9i)}{(2-6i)}$$

$$\frac{(3+2i)}{(1-i)}-\frac{(2+3i)}{(2-i)}$$

EXERCISE

The complex impedance Z in a series LCR circuit is given by $Z=R+i\omega L+\dfrac{1}{i\omega C}$.

Express Z in $a+bi$ form when $R=10$, L=5, C=0.04 and ω=4.