

NCERT CHAPTER 4

Complex Numbers & Quadratic Equations

Powers of i , algebra of complex numbers, modulus, conjugate, multiplicative inverse, and complex quadratic roots.

⌚ Revision Time: 25 mins 🎯 Target: 5–6 Marks 📖 Textbook: [kemh104.pdf](#)

⚡ Essential Formulas & Concept Summary

1. POWERS OF i

$$i^1 = i, \quad i^2 = -1, \quad i^3 = -i, \quad i^4 = 1$$

$$\text{Sum of 4 consecutive powers of } i = 0 : \quad i^n + i^{n+1} + i^{n+2} + i^{n+3} = 0$$

2. CONJUGATE, MODULUS & MULTIPLICATIVE INVERSE

For $z = a + ib$:

$$\begin{aligned} \text{Conjugate: } \bar{z} &= a - ib \\ \text{Modulus: } |z| &= \sqrt{a^2 + b^2}, \quad z \cdot \bar{z} = |z|^2 \\ \text{Multiplicative Inverse: } z^{-1} &= \frac{\bar{z}}{|z|^2} = \frac{a - ib}{a^2 + b^2} \end{aligned}$$

3. STANDARD FORM $A + IB$ & QUADRATIC FORMULA

- To simplify $\frac{a + ib}{c + id}$, multiply numerator and denominator by $(c - id)$.
- Quadratic roots when $D < 0$: $x = \frac{-b \pm i\sqrt{4ac - b^2}}{2a}$.

🎯 Top Expected Exam Questions (Step-by-Step Solutions)

Question 1: Standard $(x + iy)^3 = u + iv$ Identity

4 Marks

If $(x + iy)^3 = u + iv$, then show that: $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$

Question 2: Multiplicative Inverse

2–3 Marks

Find the multiplicative inverse of $z = 4 - 3i$.

⚠️ Exam Traps & Silly Mistakes

⚠️ Trap 1: $\sqrt{-a}\sqrt{-b}$ Fallacy

$$\sqrt{-a}\sqrt{-b} = (i\sqrt{a})(i\sqrt{b}) = -\sqrt{ab}, \text{ not } \sqrt{ab}.$$

⚠️ Trap 2: Sign of i^2

Remember that $(ib)^2 = -b^2$.

✅ Quick Self-Check

Quiz 1: Evaluate i^{99} .

Quiz 2: Find $|3 - 4i|$.