

Assignment

Chapter 5 (Complex numbers and Quadratic equations)

Q1. Find the conjugate of each of the following (i) $(5+\sqrt{2}i)^3$ (ii) $(6-3i)(2+5i)$

Q2. Find the magnitude of the following: $z = \frac{2+6\sqrt{3}i}{5+\sqrt{3}i}$

Q3. Find the multiplicative inverse of following: (i) $\frac{(i+1)(i-2)}{(i-1)(i+2)}$ (ii) $\frac{(2+3i)}{(3-2i)}$

Q4. Solve the following for x and y:
$$i) \frac{(1+i)2x-2i}{3+i} + \frac{(2-3i)y+i}{3-i} = i$$
$$ii) 3+ix^2y = \overline{x^2+y+4i}$$

Q5. Express each of the following complex numbers in polar form:

i) $\frac{(1+7i)}{(2-i)^2}$ ii) $\frac{1-3i}{1+2i}$ iii) $\frac{2+6\sqrt{3}i}{5+\sqrt{3}i}$ iv) $-3\sqrt{2}+3\sqrt{2}i$

Q6. Find the modulus and argument of the following complex numbers:

i) $2\sqrt{3}-2i$ ii) $-2+2i\sqrt{3}$

Q7. Prove that the following complex numbers are purely real;

i) $\left(\frac{2+3i}{3-4i}\right)\left(\frac{2-3i}{3+4i}\right)$ ii) $\left(\frac{3+2i}{2-3i}\right) + \left(\frac{3-2i}{2+3i}\right)$

Q8. Find the square root of

i) $-15-8i$ ii) $7-24i$

Q9. Solve the following quadratic equations:

i) $x^2 - (3\sqrt{2}-2i)x - 6\sqrt{2}i = 0$

ii) $(2+i)x^2 - (5-i)x + 2(1-i) = 0$

iii) $x^2 - (5-i)x + (18+i) = 0$

Q10. Show that a real value of x will satisfy the equation $\frac{1-ix}{1+ix}a = a-ib$ if

$a^2 + b^2 = 1$, where a, b are real.

Q11. If $z = x+iy$ and $w = \frac{1-iz}{z-i}$, $|w|=1 \Rightarrow z$ is purely real.

Q12. Evaluate the following:

i) $2x^3 + 2x^2 - 7x + 72$, when $x = \frac{3-5i}{2}$

ii) $x^4 - 4x^3 + 4x^2 + 8x + 44$, $x = 3+2i$

Chapter 1 (Sets)

- 1) $X = \{8^n - 7n - 1 : n \in \mathbb{N}\}$ and $Y = \{49(n-1) : n \in \mathbb{N}\}$, then prove that $X \subseteq Y$.
- 2) If A and B are two sets such that $A \subset B$, then write $B' - A'$ in terms of A and B.
- 3) Let A and B be two sets having 4 and 7 elements respectively. Then write the maximum number of elements that $A \cup B$ can have.
- 4) Find the symmetric difference of $A = \{x \in \mathbb{C} : x^2 = 1\}$ and $B = \{x \in \mathbb{C} : x^4 = 1\}$
- 5) Using properties of sets, show that for any two sets A and B,
 - i) $(A \cup B) \cap (A \cap B') = A$
 - ii) $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$
- 6) A survey shows that 63% of the Americans like cheese whereas 76% like apples. If x% of the Americans like both cheese and apples. Find the value of x.
- 7) In a survey of 100 students, the number of students studying the various languages were found to be English only 18, English but not Hindi 23, English and Sanskrit 8, English 26, Sanskrit 48, Sanskrit and Hindi 8, no language 24. Find
 - i) How many students were studying Hindi
 - ii) How many students were studying English and Hindi.
- 8) State and prove De-Morgan's laws.
- 9) Find the power set of $\{\emptyset, \{\emptyset\}\}$
- 10) For two sets A and B define symmetric difference.