

Board – CBSE

Class – 11

Topic – Complex Numbers and Quadratic Equations

Very Short Answer Type Questions (1 Mark)

1. Evaluate, $\sqrt{-16} + 3\sqrt{-25} + \sqrt{-36} - \sqrt{-625}$
2. Evaluate, $i^{29} + \frac{1}{i^{29}}$
3. Find values of x and y if, $(3x - 7) + 2iy = -5y + (5 + x) i$
4. Express $\frac{i}{1+i}$ in the form $a + ib$
5. Express $z = \frac{i}{3+4i}$ find the conjugate of z
6. Find the modulus of $z = 3 - 2i$
7. If z is a purely imaginary number and lies on the positive direction of y-axis, then what is the argument of z?
8. Find the multiplicative inverse of $5 + 3i$
9. If $|z| = 4$ and argument of $z = \frac{5\pi}{6}$ then write z in the form $x + iy$; $x, y \in \mathbb{R}$
10. If $z = 1 - i$, find $\text{Im}\left(\frac{1}{z\bar{z}}\right)$
11. Simplify $(-i)(3i)\left(\frac{-1i}{6}\right)^3$
12. Find the solution of the equation $x^2 + 5 = 0$ in complex numbers.

Short Answer Type Questions (4 Marks)

13. For Complex numbers $z_1 = -1 + i, z_2 = 3 - 2i$ show that, $\text{Im}(z_1 z_2) = \text{Re}(z_1) \text{Im}(z_2) + \text{Im}(z_1) \text{Re}(z_2)$
14. Convert the complex number $-3\sqrt{2} + 3\sqrt{2}i$ in polar form
15. If $x + iy = \sqrt{\frac{1+i}{1-i}}$, prove that $x^2 + y^2 = 1$
16. Find real value of θ such that, $\frac{1+i \cos \theta}{1-2i \cos \theta}$ is a real number
17. If $\left|\frac{z-5i}{z+5i}\right| = 1$, show that z is a real number.
18. If $(x + iy)^{\frac{1}{3}} = a + ib$, prove that $\left(\frac{x}{a} + \frac{y}{b}\right) = 4(a^2 - b^2)$
19. For complex numbers $z_1 = 6 + 3i, z_2 = 3 - i$ find $\frac{z_1}{z_2}$

20. If $\left(\frac{2+2i}{2-2i}\right)^n = 1$, find the least positive integral value of n .

21. Find the modulus and argument of $z = 2 - 2i$

22. Solve the equation, $\sqrt{3x^2} - \sqrt{2x} + 3\sqrt{3} = 0$

Long Answer Type Questions (6 Marks)

23. If z_1, z_2 are complex numbers such that, $\left|\frac{z_1 - 3z_2}{3 - z_1\bar{z}_2}\right| = 1$ and $|z_2| \neq 1$ then find $|z_1|$

24. Find the square root of $-3 + 4i$ and verify your answer.

25. If $x = -1 + i$ then find the value of $x^4 + 4x^3 + 4x^2 + 2$

Answer

1. 0

2. 0

3. $x = -1, y = 2$

4. $\frac{1}{2} + \frac{1}{2}i$

5. $\bar{z} = \frac{3}{25} + \frac{4i}{25}$

6. $\sqrt{13}$

7. $\frac{\pi}{2}$

8. $\frac{5}{34} - \frac{3i}{34}$

9. $z = -2\sqrt{3} + 2i$

10. 0

11. $\frac{i}{72}$

12. $x = \pm i\sqrt{5}$

14. $z = 6\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$

16. $\theta = \frac{(2n+1)\pi}{2}, n \in \mathbb{Z}$

17. Hint : use property $\left|\frac{z_1}{z_2}\right| = \frac{|z_1|}{|z_2|}$

19. $\frac{z_1}{z_2} = \frac{3(1+i)}{2}$

20. $n = 4$

21. modulus = $2\sqrt{2}$, argument = $\frac{-\pi}{4}$

22. $x = \frac{\sqrt{2} \pm i\sqrt{34}}{2\sqrt{3}}$

23. Hint: $|z|^2 = z \cdot \bar{z}$, $|z_1| = 3$

24. $\pm(1 + 2i)$

25. 6