Transweb Educational Services Pvt Ltd
B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Class: IX
Subject: Math
Topic: Complex Numbers
No. of Questions: 25

1. If z_1 and z_2 are two complex numbers, and a and b are two real numbers, then $|az_1 - bz_2|^2 + |bz_1 + az_2|^2$ equals

(A) $(a^2 + b^2)|z_1 z_2|$
(B) $(a^2 + b^2)(z_1^2 + z_2^2)$
(C) $(a^2 + b^2)(|z_1|^2 + |z_2|^2)$
(D) $2ab|z_1z_2|$

2. If $z \neq 0$ is a complex number such that Re(z) = 0, then

(A) $Re(z^2) = 0$
(B) $Im(z^2) = 0$
(C) $Re(z^2) = Im(z^2)$
(D) None of these

3. Suppose z_1, z_2, z_3 are the vertices of an equilateral triangle inscribed in the circle | z | = 2. If $z_1 = 1 + \sqrt{3}i$, then z_2 and z_3 are respectively

(A) $2, 1 - \sqrt{3}i$
(B) $1 + \sqrt{3}i, -2$
(C) $2, -1 + \sqrt{3}i$
(D) $2, 2 + \sqrt{3}i$

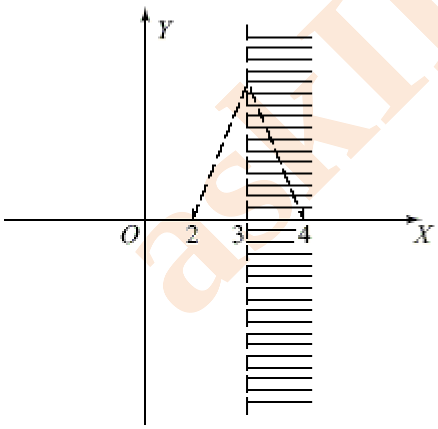
4. Let z and w be two complex numbers such that | z | = | w | = 1 and | z + iw | = | z – i $\overline{w}$ | = 2. Then z equals

(A) 1 or i
(B) i or – i
(C) 1 or – 1
(D) i or – 1

5. If $\omega(\neq 1)$ is a complex cube root of unity, the least value of n $\in$ N for which $(1 + \omega^2)^n = (1 + \omega^4)^n$ i is

(A) 6
(B) 5
(C) 3
(D) 2

6. The inequality | z – 4| < | z – 2 | represents the region given by



(A) Re(z) $\geq$ 0
(B) Re(z) < 3
(C) Re(z) $\leq$ 0
(D) Re(z) > 3

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7. For any complex number z, the minimum value of $|z| + |z - 2i|$ is

(A) 0
(B) 1
(C) 2
(D) None of these

8. If $z = x + iy$ and $w = \frac{1 - iz}{z - i}$, then $|w| = 1$ implies that in the complex plane

(A) z lies on the imaginary axis
(B) z lies on the real axis
(C) z lies on the unit circle
(D) none of these

9. If the imaginary part of $\frac{2z + 1}{iz + 1}$ is – 4, then the locus of the point representing z in the complex plane is
(A) a straight line
(B) a parabola
(C) a circle
(D) an ellipse

10. If ω is complex cube root of unity, then a root of the equation $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} = 0$ is

(A) x = 1
(B) $x = \omega$
(C) $x = \omega^2$
(D) x = 0

11. Let z_1 and z_2 be two non-zero complex numbers such that $\frac{z_1}{z_2} + \frac{z_2}{z_1} = 1$. Then, the origin and points represented by z_1 and z_2

(A) lie on a straight line
(B) form a right triangle
(C) form an equilateral triangle
(D) none of these

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12. The roots of $z^5 = (z - 1)^5$ are represented in the argand plane by the points that are

(A) collinear
(B) concyclic
(C) vertices of a parallelogram
(D) None of these

13. If z = $\sqrt{20i - 21} + \sqrt{20i + 21}$, then one of the possible value of arg (z) equals

(A) $\pi/4$
(B) $\pi/2$
(C) $3\pi/8$
(D) π

14. If $(4 + i)(z + \bar{z}) - (3 + i)(z - \bar{z}) + 26i = 0$, then the value of $|z|^2$ is

(A) 13
(B) 17
(C) 19
(D) 11

15. If $3^{49}(x + iy) = (3/2 + \sqrt{3}\,i/2)^{100}$, $y \in \mathbf{N}$, and x = ky, then value of k is

(A) –1/3
(B) $+2\sqrt{2}$
(C) $-1/\sqrt{3}$
(D) $+1\sqrt{3}$

16. If $z \neq 1, \frac{z^2}{z-1}$ is real, then point represented by the complex number z lies

(A) on a circle with centre at the origin
(B) either on the real axis or on a circle not passing through the origin
(C) on the imaginary axis
(D) either on the real axis or on a circle passing through the origin

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17. For complex numbers $z_1 = x_1 + iy_1$, and $z_2 = x_2 + iy_2$, we write $z_1 \cap z_2$ if $x_1 \leq x_2$ and $y_1 \leq y_2$. Let z be a complex number such that $1 \cap z$, then

18. If w is an imaginary cube root of unity, then value of the expression $1(2-\omega)(2-\omega^2) + 2(3-\omega)(3-\omega^2) + \ldots + (n-1)(n-\omega)(n-\omega^2)$ is

19. If $x + iy = \sqrt{\frac{a+ib}{c+id}}$, then $\frac{(x^2+y^2)^2(c^2+d^2)}{a^2+b^2}$ equals

20. The region of the argand plane defined by $|z - i| + |z + i| \leq 4$ is

(A) interior of an ellipse
(B) exterior of a circle
(C) interior or on the boundary of an ellipse
(D) none of these

21. if $x + iy = \sqrt{\frac{1+i}{1-i}}$, prove that $x^2 + y^2 = 1$

22. Convert in the polar form $\frac{1+7i}{(2-i)^2}$

23. Find the real values of x and y if (x - iy) (3 + 5i) is the conjugate of – 6 24 i

24. If $|z_1| = |z_2| = 1$, prove that $\left|\frac{1}{z_1} + \frac{1}{z_2}\right| = |z_1 + z_2|$

25. If α and β are different complex number with $|\beta| = 1$ Then find $\left|\frac{\beta - \alpha}{1 - \bar{\alpha}\beta}\right|$