Complex Numbers

SET 1

Fill in the Blanks

1. If the expression $\frac{[\sin(\frac{x}{2})+\cos(\frac{x}{2})-i\tan(x)]}{[1+2i\sin(\frac{x}{2})]}$ is real, then the set of all possible values of x is .....

2. For any two complex numbers z_1, z_2 and any real numbers a and b, $|az_1 - bz_2|^2 + |bz_1 + az_2|^2 =$ .....

3. If a and b are real numbers between 0 and 1 such that the points $z_1 = a + i, z_2 = 1 + bi$ and $z_3 = 0$ form an equilateral triangle then a = ... and b = ...

TRUE / FALSE

4. 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 $y_1 \leq y_2$. Then for all complex numbers z with $1 \cap z$, we have $\frac{1-z}{1+z} \cap 0$

5. If the complex numbers, z_1, z_2 and z_3 represent the vertices of an equilateral triangle such that $|z_1| = |z_2| = |z_3|$, then $z_1 + z_2 + z_3 = 0$

OBJECTIVE TYPE Only one option is correct

6. The smallest positive integer n for which $(\frac{1+i}{1-i})^n = 1$, is
   A. 8 B. 16 C. 12 D. none of these

7. The complex numbers z=x+iy which satisfy the equation $|\frac{z-5i}{z+5i}| = 1$ lie on :
   A. the x axis B. the straight line y = 5 C. a circle passing through the origin D. none of these

8. If z=$(\frac{\sqrt{3}}{2} + \frac{i}{2})^5 + (\frac{\sqrt{3}}{2} - \frac{i}{2})^5$, then :
   A. Re(z)=0 B. Im(z) =0 C. $Re(z) > 0, Im(z) > 0$ D. $Re(z) > 0, Im(z) < 0$

9. The inequality $|z - 4| < |z - 2|$ represents the region given by :
   A. $Re(z) \geq 0$ B. $Re(z) < 0$ C. $Re(z) > 0$ D. none of these

10. 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

11. The point z_1, z_2, z_3, z_4 in the complex plane are the vertices of a parallelogram taken in order , if and only if :
    A. $z_1 + z_4 = z_2 + z_3$ B. $z_1 + z_3 = z_2 + z_4$ C. $z_1 + z_2 = z_3 + z_4$ D. none of these

12. If a,b,c and u,v,w are complex numbers representing the vertices of two triangle such that c=(1-r)a+rb and w=(1-r)u+rv, where r is a complex number, then the two triangles :
    A. have the same area B. are similar C. are congruent D. none of these

13. The value of $\sum_{k=1}^{6}(\sin\frac{2\pi}{7} - i\cos\frac{2\pi k}{7})$ is :
    A. -1 B. 0 C. -i D. i

14. If z_1 and z_2 are two non zero complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$, then $\arg z_1 - \arg z_2$ is equal to :
    A. $-\pi$ B. $-\frac{\pi}{2}$ C. 0 D. $\frac{\pi}{2}$ E. π

15. The complex numbers $\sin x + i\cos 2x$ and $\cos x - i\sin 2x$ are conjugate to each other , for :
    A. x =$n\pi$ B. x=0 C. x=$(n + \frac{1}{2})\pi$ D. no value of x

16. If $\omega \neq 1$ is a cube root of unity and $(1 + \omega)^7 = A + B\omega$, then A and B are respectively :
    A. 0,1 B. 1,1 C. $\overline{\omega}$ D. $-\overline{\omega}$