Complex Numbers

Q.No.1:

If z is a complex number of unit modulus and argument θ, then arg $\left(\frac{1+z}{1+\bar{z}}\right)$ equals:

JEE 2013

- **A.** −θ
- **B.** $\frac{\pi}{2} - \theta$
- **C.** θ
- **D.** π − θ

Q.No.2: A complex number z is said to be unimodular if $|z| = 1$. Suppose z_1 and z_2 are complex numbers such that $\frac{z_1 - 2z_2}{2 - z_1 \bar{z}_2}$ is unimodular and z_2 is not unimodular. Then the point z_1 lies on a :

JEE 2015

- **A.** straight line parallel to *x*-axis
- **B.** straight line parallel to *y*-axis
- **C.** circle of radius 2
- **D.** circle of radius $\sqrt{2}$

Q.No.3: A value of θ for which $\frac{2+3i\sin\theta}{1-2i\sin\theta}$ is purely imaginary, is :

JEE 2016

- **A.** $\frac{\pi}{6}$
- **B.** $\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$
- **C.** $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$
- **D.** $\frac{\pi}{3}$

Q.No.4: Let ω be a complex number such that 2ω + 1 = z where z = $\sqrt{-3}$. If $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2 - 1 & \omega^2 \\ 1 & \omega^2 & \omega^7 \end{vmatrix}$ = 3k, then k is equal to : **JEE 2017**

A. −z
B. z
C. −1
D. 1

Q.No.5: If α, β ∈ C are the distinct roots, of the equation $x^2 - x + 1 = 0$, then $\alpha^{101} + \beta^{107}$ is equal to : **JEE 2018**

A. 1
B. 2
C. −1
D. 0

Q.No.6: Let $A = \left\{\theta \in \left(-\frac{\pi}{2}, \pi\right) : \frac{3+2i\ \sin\theta}{1-2i\ \sin\theta}\ \text{is purely imaginary}\right\}$. Then the sum of the elements in A is: **JEE 2019**

A. $\frac{5\pi}{6}$
B. π
C. $\frac{3\pi}{4}$
D. $\frac{2\pi}{3}$

Q.No.7: Let α and β be two roots of the equation $x^2 + 2x + 2 = 0$, then $\alpha^{15} + \beta^{15}$ is equal to: **JEE 2019**

A. −256
B. 512
C. −512
D. 256

Q.No.8: Let z_0 be a root of the quadratic equation, $x^2 + x + 1 = 0$. If

$z = 3 + 6iz_0^{81} - 3iz_0^{93}$, then arg z is equal to: **JEE 2019**

A. $\frac{\pi}{4}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{3}$

D. 0

Q.No.9: Let z_1 and z_2 be any two non-zero complex numbers such that $3|z_1| = 4|z_2|$. If $z = \frac{3z_1}{2z_2} + \frac{2z_2}{3z_1}$ then: **JEE 2019**

A. Re(z) = 0

B. $|z| = \sqrt{\frac{5}{2}}$

C. $z = \frac{5}{2}\cos\theta + \frac{(3\sin\theta)}{2}i$

D. Im(z) = 0

Q.No.10: Let $z = \left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^5$. If R($z$) and I($z$) respectively denote the real and imaginary parts of z, then : **JEE 2019**

A. I(z) = 0

B. R(z) > 0 and I(z) > 0

C. R(z) < 0 and I(z) > 0

D. R(z) = −3