MATHS

BOOKS - MODERN PUBLICATION MATHS (KANNADA ENGLISH)

COMPLEX NUMBERS

Multiple Choice Questions Level I

1. Evaluate $1 + i^2 + i^4 + i^6 + \ldots + i^{2n}$.

A. positive

B. negative

C. 0

D. cannot be evaluated

Answer: D

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2. Number of solutions of the equation $z^2 + |z|^2 = 0$, where $z \in C$, is

A. 1

B. 2

C. 3

D. infinitely many

Answer: D

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3. Find the amplitude of $\frac{\sin(\pi)}{5} + i\left(1 - \frac{\cos(\pi)}{5}\right)$

A. $\frac{2\pi}{5}$

B. $\frac{\pi}{5}$

C. $\frac{\pi}{15}$

D. $\frac{\pi}{10}$

Answer: D

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4. If z = x + iy lies in the third quadrant, then prove that $\frac{\bar{z}}{z}$ also lies in the third quadrant when $y < x < 0$

A. $x > y > 0$

B. $x < y < 0$

C. $y < x < 0$

D. $y > x > 0$

Answer: B

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5. If $\left(\frac{1+i}{1-i}\right)^{x} = 1,$ then

A. $x = 2n + 1$

B. $x = 4n$

C. $x = 2n$

D. $x = 4n + 1$, where $x \in N$.

Answer: B

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6. If the complex number $z + x + iy$ satisfies the condition $|z + 1| = 1,$ then z lies on $x - a\xi s$ (b) circle with centre$(-1, 0)$ and radius1 $y - a\xi s$ (d) none of these

A. x-axis

B. Circle with centre $(1, 0)$ and radius 1

C. Circle with centre $(-1, 0)$ and radius 1

D. y-axis

Answer: C

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7. The area of the triangle on the Arand plane formed by the complex numbers z, iz and z+iz is?

A. $|z|^2$

B. $|\bar{z}|^2$

C. $\frac{|z|^2}{2}$

D. None of these

Answer: C

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8. Q.2 The equation $|z+1-i| = |z+i-1|$represents a

A. straight line

B. circle

C. parabola

D. hyperbola

Answer: A

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9. The real value of α for which the expression $\dfrac{1-i\sin\alpha}{1+2i\sin\alpha}$ is purely real is

A. $(n+1)\dfrac{\pi}{2}$

B. $(2n+1)\dfrac{\pi}{2}$

C. $n\pi$

D. None of these, where $n \in N$.

Answer: C

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10. The real value of θ for which the expression $\frac{1+i\cos\theta}{1-2i\cos\theta}$ is real number is

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

B. $n\pi+(-1)^n\frac{\pi}{4}$

C. $2n\pi\pm\frac{\pi}{2}$

D. None of these

Answer: C

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11. The value of $(z+3)(\bar{z}+3)$ is equivlent to

A. $|z+3|^2$

B. $|z-3|$

C. z^2+3

D. None of these

Answer: A

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12. A real value of x satisfies the equation $\frac{3-4ix}{3+4ix}=\alpha-i\beta(\alpha,\beta\in R)$, if $\alpha^2+\beta^2=$

A. 1

B. -1

C. 2

D. -2

Answer: A

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13. if $a+ib=c+id$, then

A. $a^2+c^2=0$

B. $b^2+c^2=0$

C. $b^2+d^2=0$

D. $a^2+b^2=c^2+d^2$

Answer: D

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14. The complex number z, which satisfies the condition $\left|\frac{1+z}{1-z}\right|=1$ lies on

A. circle $x^2+y^2=1$

B. the x-axis

C. the y-axis

D. the line $x + y = 1$

Answer: C

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15. $|z_1 + z_2| = |z_1| + |z_2|$ is possible, if

A. $z_2 = \bar{z}_1$

B. $z_2 = \frac{1}{\bar{z}_1}$

C. $arg(z_1) = arg(z_2)$

D. $|z_1| = |z_2|$

Answer: C

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16. If $f(z) = \frac{7-z}{1-z^2}$, where $z = 1+2i$, then $|f(z)|$ is $\frac{|z|}{2}$ (b) $|z|$ (c) $2|z|$

(d) none of these

A. $\frac{|z|}{2}$

B. $|z|$

C. $2|z|$

D. None of these

Answer: A

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17. The complex number $\sin x + i\cos 2x$ and $\cos - i\sin 2x$ are conjugate to each other when

A. $x = n\pi$

B. $x = \left(n + \frac{1}{2}\right)\pi$

C. $x = 0$

D. no value of x

Answer: D

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18. For any complex number z, the minimum value of $|z| + |z - 1|$

A. 1

B. $\frac{1}{2}$

C. 0

D. $\frac{3}{2}$

Answer: A

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19. what is the modulus of $Z = 4 + 3i$?

A. 25

B. 5

C. -5

D. 0

Answer: B

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20. If $(a+ib)(c+id)(e+\quad \text{if}\quad)(g+ih)=A+iB$, then show that $\left(a^2+b^2\right)\left(c^2+d^2\right)\left(e^2+f^2\right)\left(g^2+h^2\right)=A^2+B^2$

A. A^2-B^2

B. A^2+B^2

C. A^4+B^4

D. A^4-B^4

Answer: B

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21. If α, β, γ are the cube roots of p then for any x, y and z $\frac{x\alpha + y\beta + z\gamma}{x\beta + y\gamma + z\alpha}$ is

A. 1

B. ω

C. ω^2

D. None of these

Answer: C

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22. If $x_r = \cos\left(\frac{\pi}{2^r}\right) + i\sin\left(\frac{\pi}{2^r}\right)$ then $x_1, x_2, x_3, \ldots.\infty$

A. $-i$

B. -1

C. i

D. 1

Answer: B

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23. The value of $\sum_{i=1}^{6}\left(\sin.\frac{2\pi k}{7}-i\cos.\frac{2\pi k}{7}\right)$

A. -1

B. 0

C. $-i$

D. i

Answer: D

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24. The points representing the complex number z for which $|z+3|^2 - |z-3|^2 = 6$ lie on

A. a st.line

B. a circle

C. a parabola

D. None of these

Answer: A

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25. Let $w = \left[\frac{z-1}{1+iz}\right]^n, n \in I,$ then $|w| = 1$ for

A. only even n

B. only odd n

C. only positive n

D. all n

Answer: D

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26. If $z = x + iy$, is any point in a complex plane, then $\bar{b}z + \mathbf{a}rz = c$, $c \in R$, represents

A. a circle

B. a st.line

C. a parabola

D. None of these

Answer: B

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27. If z_1, z_2, z_3 are three complex numbers in A.P., then they lie on :

A. a circle

B. a st.line

C. a parabola

D. an ellipse

Answer: B

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28. If $x + \frac{1}{x} = 2\cos\theta$, then $x^n + \frac{1}{x^n}$ is equal to

A. $2\cos n\theta$

B. $2\sin n\theta$

C. $\cos n\theta$

D. $\sin \ne \theta$

Answer: A

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29. Multiplication of a complex number z by i corresponds to :

A. clockwise rotation of the line joining z to origin in Argand diagram through an angle of $\frac{\pi}{2}$

B. Anticlockwise rotation of the line joining z to origin in Argand diagram through an angle of $\frac{\pi}{2}$

C. Rotation of the line joining z to origin in Argand diagram through an angle π

D. No rotation

Answer: B

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30. If $(a_1 + ib_1)(a_2 + ib_2)......(a_n + ib_n) = A + iB,$ then : $(a_1^2 + b_1^2)(a_2^2 + b_2^2)......(a_n^2 + b_n^2)$ equals :

A. 1

B. $A^2 + B^2$

C. $A + B$

D. $\dfrac{1}{A^2} + \dfrac{1}{B^2}$

Answer: B

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31. If $\infty(a_1 + ib_1)(a_2 + ib_2)..................(a_n + ib_n) = A + iB$, then $\sum_{i=1}^{n} \tan^{-1}\left(\dfrac{b_i}{a_i}\right)$ is equal to

A. $\dfrac{B}{A}$

B. $\tan\left(\dfrac{B}{A}\right)$

C. $\tan^{-1}\left(\dfrac{B}{A}\right)$

D. $\tan^{-1}\left(\frac{A}{B}\right)$

Answer: C

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32. Let z and w be two non-zero complex numbers such that $|z| = |w|$ and arg.(z) + arg.$(w) = \pi$. Then z equals :

A. w

B. $-w$

C. $\overline{w}$

D. $-\overline{w}$

Answer: D

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33. If $a = \cos\left(\frac{4\pi}{3}\right) + i\sin\left(\frac{4\pi}{3}\right)$, then the value of $\left(\frac{1+a}{2}\right)^{3n}$ is :

A. $(-1)^n$

B. $\frac{(-1)^n}{2^{3n}}$

C. $\frac{1}{2^{3n}}$

D. $\left(-\frac{1}{2}\right)^{3n}$

Answer: B

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34. If $z = x + iy$, $z^{\frac{1}{3}} = a - ib$ and $\frac{x}{a} - \frac{y}{b} = \lambda(a^2 - b^2)$, then λ is equal to

A. 3

B. 4

C. 2

D. None of these

Answer: B

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35. If z_1, z_2 are conjugate complex numbers and z_3, z_4 are also conjugate, then arg.$\left(\frac{z_3}{z_2}\right)$ is :

A. $agr.\left(\frac{z_1}{z_4}\right)$

B. $agr.\left(\frac{z_4}{z_1}\right)$

C. $agr.\left(\frac{z_2}{z_4}\right)$

D. $agr.\left(\frac{z_1}{z_3}\right)$

Answer: A

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36. If z_1, z_2 are two complex numbers satisfying the equation :

$\left|\frac{z_1 - z_2}{z_1 + z_2}\right| = 1$, then $\frac{z_1}{z_2}$ is a number which is

A. positive real

B. negative real

C. zero

D. purely imaginary

Answer: D

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37. If $\frac{1 - i\alpha}{1 + i\alpha} = A + iB$, then $A^2 + B^2$ is :

A. 1

B. α^2

C. -1

D. $-\alpha^2$

Answer: A

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38. If $z_r = \cos. \frac{2r\pi}{5} + i \sin. \frac{2r\pi}{5}, \quad r = 0, 1, 2, 3, 4,$ then $z_1 z_2 z_3 z_4 z_5$ equals

A. -1

B. 0

C. 1

D. None of these

Answer: C

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39. The area of triangle with vertices affixed at $z, iz, z(1 + i)$ is

A. $\frac{1}{4}|z|^2$

B. $\frac{1}{3}|z|^2$

C. $|z|^2$

D. $\frac{1}{2}|z|^2$

Answer: D

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40. If $z_k = \cos.\frac{\pi}{2^k} + i\sin.\frac{\pi}{2^k}, k = 1, 2............$, then the value of $z_1 z_2$ ....to ∞ is

A. 0

B. 1

C. -1

D. 2

Answer: C

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41. If $1, \omega, \omega^2$ are cube roots of unity , then for α, β, γ , $\delta \in R$,
$\dfrac{\alpha + \beta\omega + \gamma\omega^2 + \delta\omega^3}{\beta + \alpha\omega^2 + \gamma\omega + \delta\omega^2}$ equals :

A. 1

B. $-\omega$

C. ω

D. $\dfrac{1}{\omega}$

Answer: C

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42. If $1, \omega, \omega^2, \dots\omega^{n-1}$ are n, nth roots of unity, find the value of $(9-\omega)(9-\omega^2)\dots(9-\omega^{n-1})$.

A. 0

B. n

C. $\frac{9^n + 1}{8}$

D. $\frac{9^n - 1}{8}$

Answer: D

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43. $\sqrt{i} + \sqrt{(-i)}$ equals :

A. 0

B. i

C. $-i$

D. $\sqrt{2}$

Answer: B

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44. If $\alpha = \cos\left(\frac{8\pi}{11}\right) + i\sin\left(\frac{8\pi}{11}\right)$ then $Re\left(\alpha + \alpha^2 + \alpha^3 + \alpha^4 + \alpha^5\right)$ is

A. $\frac{1}{2}$

B. 0

C. $\frac{-1}{2}$

D. None of these

Answer: C

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45. If $1, \omega, \omega^2$ are cube roots of unity, then the value of $(1+\omega)^3 - \left(1+\omega^2\right)^3$ is :

A. 2ω

B. 2

C. -2

D. 0

Answer: D

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46. The points representing $\sqrt[3]{5 + i\sqrt{3}}$ lie.

A. on a st.line

B. on a circle with centre $(0, 0)$ and radius $\sqrt{2}$

C. on a circle with centre $(0, 0)$ and radius $2\sqrt{2}$

D. None of these

Answer: B

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47. If $z = i \log(23, then \cos z = \ -1$ b. $-1/2$ c. 1 d. $1/2$

A. i

B. $2i$

C. 1

D. 2

Answer: D

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48. Prove that the triangle formed by the points $1, \frac{1+i}{\sqrt{2}}, andi$ as vertices in the Argand diagram is isosceles.

A. scalene

B. equilateral

C. isosceles

D. right angle

Answer: C

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49. If $(a+ib)^5+\alpha+i\beta$ then $(b+ia)^5$ is equal to (A) $\beta-i\alpha$ (B) $\beta+i\alpha$ (C) $\alpha-i\beta$ (D) $-\alpha-i\beta$

A. $\alpha-i\beta$

B. $\beta+i\alpha$

C. $\beta-i\alpha$

D. $-\alpha-i\beta$

Answer: B

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50. If $z=\dfrac{\sqrt{3}+i}{\sqrt{3}-i}$, then the fundamental amplitude of z is :

A. $-\dfrac{\pi}{3}$

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

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

D. None of these

Answer: C

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51. If $\left|\frac{z-2}{z+2}\right| = \frac{\pi}{6}$, then the locus of z is

A. st.line

B. a circle

C. a parabola

D. a hyperbola

Answer: B

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52. If α, β are complex cube roots of unity and $x = a + b$, $y = a\alpha + \boldsymbol{\eta}$, $z = a\beta + b\alpha$, then the value of $\dfrac{x^3 + y^3 + z^3}{xyz}$ is:

A. ab

B. $a^3 + b^3$

C. $a^2 + ab + b^2$

D. None of these

Answer: D

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53. If $|z_1 + z_2| = |z_1 - z_2|$, then the difference of the arguments of z_1 and z_2 is

A. 0

B. $\dfrac{\pi}{2}$

C. π

D. 2π

Answer: B

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54. If $\omega \neq 1$ is a cube root of unity such that :

$\frac{1}{a+\omega}+\frac{1}{b+\omega}+\frac{1}{c+\omega}=2\omega^2$ and $\frac{1}{a+\omega^2}+\frac{1}{b+\omega^2}+\frac{1}{c+\omega^2}=2\omega$, then the value of $\frac{1}{a+1}+\frac{1}{b+1}+\frac{1}{c+1}$ is :

A. -2

B. 2

C. $-1+\omega^2$

D. None of these

Answer: B

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55. If α is a root of $x^7 = 1$ and $\alpha \neq 1$, then $\alpha^{101} + \alpha^{102} + ... + \alpha^{205}$ is :

A. 0

B. 104

C. -104

D. 1

Answer: A

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56. If $arg(z) < 0,$ then find $arg(-z) - arg(z)$.

A. π

B. $-\pi$

C. $-\frac{\pi}{2}$

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

Answer: A

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57. If $2\cos\theta = x + \frac{1}{x}$ and $2\cos\phi = y + \frac{1}{y}$, then

A. $\frac{x}{y} + \frac{y}{x}$

B. $2\left(\frac{x}{y} + \frac{y}{x}\right)$

C. $\frac{1}{2}\left(xy + \frac{1}{xy}\right)$

D. $xy + \frac{1}{xy}$

Answer: C

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58. The complex number z_1, z_2 and z_3 satisfying $\frac{z_1 - z_3}{z_2 - z_3} = \frac{1 - i\sqrt{3}}{2}$ are the vertices of a triangle which is :

A. of area zero

B. right-angled isosceles

C. equilateral

D. obtuse-angled isosceles

Answer: C

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59. Let z_1 and z_2 be nth roots of unity which subtend a right angle at the origin. Then n must be of the form (1) $4k+1$ (2) $4k+2$ (3) $4k+3$ (4) $4k$

A. $4k+1$

B. $4k+2$

C. $4k+3$

D. $4k$

Answer: D

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60. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & -3i & -1 \\ 20 & 3 & i \end{vmatrix} = x + iy$, then :

A. $x = 3, y = 1$

B. $x = 1, y = 3$

C. $x = 0, y = 3$

D. $x = 0, y = 0$

Answer: D

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61. If ω is an imaginary cube root of unity, then $(1 + \omega + \omega^2)^7$ equals :

A. 128ω

B. -128ω

C. $128\omega^2$

D. $-128\omega^2$

Answer: D

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62. If $\omega(\neq 1)$ is a cube root of unity, then $\begin{vmatrix} 1 & 1+\omega^2 & \omega^2 \\ 1-i & -1 & \omega^2-1 \\ -i & -1+\omega & -1 \end{vmatrix}$ equals :

A. zero

B. 1

C. i

D. ω

Answer: A

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63. If $\left(\frac{1+i}{1-i}\right)^{m}=1$, then the least positive integral value of m is

A. $x=2n$, where n is any positive integer

B. $x=4n+1$, where n is any positive integer

C. $x=2n+1$, where n is any positive integer

D. $x=4n$, where n is any positive integer

Answer: D

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64. If $z=x-iy, z^{\frac{1}{2}=p+iq}$, then : $\left(\frac{x}{p}+\frac{y}{q}\right)/\left(p^{2},q^{2}\right)$ is equal to:

A. 1

B. -1

C. 2

D. -2

Answer: D

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65. If $\left|z^2-1\right|=|z|^2+1$, then z lies on :

A. the real axis

B. the imaginary axis

C. a circle

D. an ellipse

Answer: C

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66. If ωbe a cube root of unity and $\left(1+\omega^2\right)^n=\left(1+\omega^4\right)^n$, then the least positive value of n is

A. 2

B. 3

C. 5

D. 6

Answer: B

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67. If the cube root of unity are $1, \omega, \omega^2$, then the roots of the equation $(x-1)^3+8=0$ are :

A. $-1, \ -1, \ -1$

B. $-1, \ -1+2\omega, \ -1-2\omega^2$

C. $-1, 1+2\omega, 1+2\omega^2$

D. $-1, 1-2\omega, 1-2\omega^2$

Answer: D

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Multiple Choice Questions Level Ii

1. If $z = -1$, the principal value of arg. $\left(z^{2/3}\right)$ is equal to :

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

B. $\frac{2\pi}{3}$ or 2π

C. $\frac{10\pi}{3}$

D. π

Answer: B

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2. Common roots of equations :

$z^3 + 2z^2 + 2z + 1 = 0$ and $z^{1985} + z^{100} + 1 = 0$ are :

A. ω, ω^2

B. $1, \omega, \omega^2$

C. $-1, \omega, \omega^2$

D. $-\omega, \ -\omega^2$

Answer: A

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3. The locus of z, which satisfies the inequality $\log_{0.3}|z-1| > \log_{0.3}|z-i|$ is given by :

A. $x+y<0$

B. $x-y>0$

C. $x+y>0$

D. $x-y<0$

Answer: A

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4. The three vertices of a triangle are represented by the complex numbers 0, z_1 and z_2. If the triangle is equilateral , then :

A. $z_1^2 - z_2^2 = z_1 z_2$

B. $z_2^2 - z_1^2 = z_1 z_2$

C. $z_1^2 + z_2^2 = z_1 z_2$

D. $z_1^2 + z_2^2 + z_1 z_2 = 0$

Answer: C

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5. The points z_1, z_2, z_3, z_4 in complex plane are the vertices of a parallelogram, taken in order 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. $z_1 - z_2 = z_3 - z_4$

Answer: B

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6. If $z = x + iy$ and $w = \frac{1 - iz}{1 + iz}$, 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

Answer: B

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7. The locus of the point satisfying the condition amp. $\left(\frac{z-1}{z+1}\right)=\frac{\pi}{3}$ is

A. st.line passing through origin

B. circle

C. parabola

D. a st.line not passing through origin

Answer: B

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8. If the imaginary part of $\frac{2z+1}{iz+1}$ is -2, then the locus of the point representing z in the complex plane is

A. a circle

B. a st.line

C. a parabola

D. None of these

Answer: B

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9. If $|z| < 4$, then $|iz + 3 - 4i|$ is less than :

A. 4

B. 5

C. 6

D. 9

Answer: D

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10. The equation not representing a circle is given by

A. Re. $\left(\frac{1+z}{1-z}\right)=0$

B. $z\bar{z}+iz-i\bar{z}+1=0$

C. $arg.\left(\frac{z-1}{z+1}\right)=\frac{\pi}{2}$

D. $\left|\frac{z-1}{z+1}\right|=1$

Answer: D

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11. If $\alpha+i\beta=\tan^{-1}z, z=x+iy$ and α is constant, then locus of z is:

A. $x^2+y^2+2x\cot 2\alpha=1$

B. $\cot 2\alpha\left(x^2+y^2\right)=1+x$

C. $x^2+y^2+2y\tan 2\alpha=1$

D. $x^2+y^2+2x\tan 2\alpha=1$

Answer: A

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12. If ω is an imaginary cube root of unity, then the value of $\frac{1}{1+2\omega}+\frac{1}{2+\omega}-\frac{1}{1+\omega}$ is :

A. -2

B. -1

C. 1

D. 0

Answer: D

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13. In complex plane, the equation $|z+\bar{z}|=|z-\bar{z}|$ represents:

A. two intersecting lines

B. two parallel lines

C. four lines

D. a circle passing through the origin

Answer: D

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14. The complex plane of $z = x + iy$, which satisfies the equation $\left|\frac{z-5i}{z+5i}\right| = 1$, lies on

A. the line $y = 5$

B. a circle through the origin

C. the x-axis

D. None of these

Answer: C

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15. If $|z_1| = |z_2| = |z_3| = 1$ and $z_1 + z_2 + z_3 = 0$, then z_1, z_2, z_3 are vertices of

A. a right angled triangle

B. an equilateral triangle

C. isosceles triangle

D. scnlene triangle

Answer: B

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16. $(\cos 2\theta + i\sin 2\theta)^{-5}(\cos 3\theta - i\sin 3\theta)^6(\sin\theta - i\cos\theta)^3$ is

A. $\cos 25\theta + i\sin 25\theta$

B. $i(\cos 25\theta + i\sin 25\theta)$

C. $i(\cos 25\theta - i\sin 25\theta)$

D. $\cos 25\theta - i\sin 25\theta$

Answer: C

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17. If $z_1 = 9y^2 - 4 - 10ix,\ z_2 = 8y^2 + 20i,$ where $z_1 = z_2$, then $z = x + iy$ is equal to

A. $-2 + 2i$

B. $-2 \pm 2i$

C. $-2 \pm i$

D. None of these

Answer: B

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18. If $1 + x^2 = \sqrt{3}x$, then $\sum_{n=1}^{24} \left(x^n - \frac{1}{x^n}\right)^2$ equals

A. 48

B. -24

C. $\pm 48(\omega - \omega^2)$

D. None of these

Answer: B

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19. If $|z_1| = |z_2| = |z_3| = |z_4|$, then the points representing z_1, z_2, z_3, z_4 are :

A. concyclic

B. vertices of a square

C. vertices of a rhombus

D. None of these

Answer: A

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20. If z_1, z_2, z_3 represent the vertices of an equilateral triangle such that $|z_1| = |z_2| = |z_3|$, then

A. $z_1 + z_2 = z_3$

B. $z_1 + z_2 + z_3 = 0$

C. $z_1 z_2 = \frac{1}{z_3}$

D. $z_1 - z_2 = z_3 - z_2$

Answer: B

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21. If α, β are two complex numbers such that $|\alpha| = 1, |\beta| = 1$, then the expression $\left|\frac{\beta - \alpha}{1 - \overline{\alpha}\beta}\right|$ equals

A. $\frac{1}{2}$

B. 1

C. 2

D. None of these

Answer: B

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22. If $\frac{(a+ib)^2}{a-ib}-\frac{(a-ib)^2}{a+ib}=x+iy$, then x equals

A. 0

B. $\frac{6a^2b}{(a^2+b^2)^2}$

C. $\frac{-2b^3}{(a^2+b^2)^2}$

D. None of these

Answer: A

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23. If α is the nth root of unity then $1+2\alpha+3\alpha^2+$ ....to n terms is equal to

A. $\frac{-n}{(1-\alpha)^2}$

B. $\frac{-n}{1-\alpha}$

C. $\frac{-2n}{1-\alpha}$

D. $\frac{-2n}{(1-\alpha)^2}$

Answer: B

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24. If $\frac{\pi}{2}<\alpha<\frac{3\pi}{2}$, the modulus and argument form of $(1+\cos 2\alpha)+i\sin 2\alpha$ is

A. $-2\cos\alpha\{\cos(\pi+\alpha)+i\sin(\pi+\alpha)\}$

B. $2\cos\alpha\{\cos\alpha+i\sin\alpha\}$

C. $2\cos\alpha\{\cos(-\alpha)+i\sin(-\alpha)\}$

D. $-2\cos\alpha\{\cos(\pi-\alpha)+i\sin(\pi-\alpha)\}$

Answer: A

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25. If $\log_{1/2}\cdot\frac{|z|^2+2|z|+4}{2|z|^2+1}<0$, then the region traced by z is :

A. $|z|<3$

B. $1<|z|<3$

C. $|z|>1$

D. $|z|<2$

Answer: A

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26. If z_1, z_2, z_3 are the vertices of an equilateral triangle in the Argand plane, then

$\left(z_1^2 + z_2^2 + z_3^3\right) = \lambda(z_1 z_2 + z_2 z_3 + z_3 z_1)$ holds true when :

A. $\lambda = 1$

B. $\lambda = 2$

C. $\lambda = 3$

D. $\lambda = 4$

Answer: A

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27. If α, β and γ are the roots of $x^3 - 3x^2 + 3x + 7$, where ω is a cube root of unity, then

$\dfrac{\alpha - 1}{\beta - 1} + \dfrac{\beta - 1}{\gamma - 1} + \dfrac{\gamma - 1}{\alpha - 1}$ equals :

A. ω^2

B. $2\omega^2$

C. $3\omega^2$

D. $\frac{3}{\omega}$

Answer: C

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28. The value of the expression :

$2(1+\omega)(1+\omega^2)+3(2\omega+1)(2\omega^2+1)+4(3\omega+1)(3\omega^2+1)+\ldots..+($

where ω is a cube root of unity is

A. $\left(\frac{n(n+1)}{2}\right)^2$

B. $\left(\frac{n(n+1)}{2}\right)^2-n$

C. $\left(\frac{n(n+1)}{2}\right)^2+n$

D. None of these

Answer: C

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29. If $|a_k| < 3, 1 \leq k \leq n,$ then all complex numbers z satisfying equation $1 + a_1 z + a_2 z^2 + \text{.........} + a_n z^n = 0$

A. inside the circle $|z| = \frac{1}{4}$

B. outside the circle $|z| = \frac{1}{4}$

C. on the circle $|z| = \frac{1}{4}$

D. in $\frac{1}{3} < |z| < \frac{1}{2}$

Answer: B

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30. If z_1, z_2, z_3 are the affixes of the vertices of a triangle having its circumcenter at the origin. If z is the affix of its orthocenter, then

A. $z_1 + z_2 + z_3 - z = 0$

B. $z_1 - z_2 + z_3 + z = 0$

C. $z_1 + z_2 - z_3 + z = 0$

D. $-z_1 + z_2 + z_3 + z = 0$

Answer: A

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31. If $x = \cos\theta + i\sin\theta,\ y = \cos\phi + i\sin\phi,\ z = \cos\Psi + i\sin\Psi$ and $\frac{y}{z} + \frac{z}{x} + \frac{x}{y} = 1$, then : $\cos(\phi - \Psi) + \cos(\Psi - \theta) + \cos(\theta - \phi)$ is :

A. $\frac{3}{2}$

B. $\frac{-3}{2}$

C. 0

D. 1

Answer: D

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32. " If $Z \in C$ satisfies $|z| \geq 3$ then the least value of $\left|z + \frac{1}{z}\right|$ is

A. $\frac{10}{3}$

B. $\frac{8}{3}$

C. $\frac{4}{3}$

D. 2

Answer: B

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33. $\tan\left(i\log\left(\frac{a+ib}{a-ib}\right)\right) =$

A. $\frac{ab}{a^2+b^2}$

B. $\frac{2ab}{a^2-b^2}$

C. $\frac{ab}{a^2-b^2}$

D. $\frac{2ab}{a^2+b^2}$

Answer: B

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34. If $z_1 = 9y^2 - 4 - 10ix$, $z_2 = 8y^2 + 20i$, where $z_1 = \bar{z}_2$, then $z = x + iy$ is equal to

A. $-2 + 2i$

B. $-2 \pm i$

C. $-2 \pm 2i$

D. None of these

Answer: C

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35. The value of $\sum_{k=1}^{13} \left(i^n + i^{n+1}\right)$, where $i = \sqrt{-1}$ equals :

A. i

B. $i - 1$

C. $-i$

D. None of these

Answer: B

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36. If z_1, z_2, z_3 are complex numbers such that : $|z_1| = |z_2| = |z_3| = \left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right| = 1$, then $|z_1 + z_2 + z_3|$ is equal to

A. 1

B. less than 1

C. greater than 1

D. equal to 3

Answer: A

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37. If ω is the cube root of unity of the equation $z^3 = 1$, then the value of : $\frac{1}{2} + \frac{3}{8} + \frac{9}{32} + \frac{27}{128} + \ldots .$ to $\infty \frac{\omega}{2} + \omega^2$ is

A. -1

B. 1

C. $-i$

D. i

Answer: A

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38. Let $z and w$ be two non-zero complex number such that $|z| = |w|$ and $arg(z) + arg(w) = \pi$, then z equals. w (b) $-w$ (c) w (d) $-w$

A. $\overline{w}$

B. $-\overline{w}$

C. w

D. $-w$

Answer: B

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39. For all complex numbers z_1, z_2 satisfying $|z_1| = 12$ and $|z_2 - 3 - 4i| = 5$, find the minimum value of $|z_1 - z_2|$

A. 0

B. 2

C. 7

D. 17

Answer: B

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40. Let z_1 and z_2 be two roots of the equation $z^2 + az + b = 0$, z being complex number, assume that the origin z_1 and z_2 form an equilateral triangle , then

A. $a^2 = 2b$

B. $a^2 = 3b$

C. $a^2 = 4b$

D. $a^2 = b$

Answer: B

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41. If $|z| = 1$ and $w = \dfrac{z-1}{z+1}$ (where $z \neq -1$), then $Re(w)$ is :

A. 0

B. $-\dfrac{1}{|z+1|^2}$

C. $\left|\dfrac{z}{z+1}\right|\dfrac{1}{|z+1|^2}$

D. $\dfrac{\sqrt{2}}{|z+1|^2}$

Answer: A

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42. The complex number z is such that $|z| = 1, z \neq -1$ and $w = \dfrac{z-1}{z+1}$.

Then real part of w is

A. $\dfrac{1}{|z+1|^2}$

B. $\dfrac{-1}{|z+1|^2}$

C. $\dfrac{\sqrt{2}}{|z+1|^2}$

D. 0

Answer: D

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43. Let z, w be complex numbers such that $\bar{z} + i\overline{w} = 0$ and arg $zw = \pi$.

Then arg z equals

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

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

C. $\frac{3\pi}{4}$

D. $\frac{5\pi}{4}$

Answer: C

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44. 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 equals :

A. $-\pi$

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

C. $-\frac{\pi}{2}$

D. 0

Answer: D

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45. If $w=\frac{z}{z-\frac{1}{3}i}$ and $|w|=1$, then z lies on

A. a circle

B. an ellipse

C. a parabola

D. a straight line

Answer: D

Watch Video Solution

46. If a, b, c are integers not all equal and ω is a cube root of unity $(\omega \neq 1)$, then the minimum value of $\left|a + b\omega + c\omega^2\right|$ is

A. 0

B. 1

C. $\frac{\sqrt{3}}{2}$

D. $\frac{1}{2}$

Answer: B

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47. If $w = \alpha + i\beta$, where $\beta \neq 0$ and $z \neq 1$, satisfies the condition that $\left(\frac{w - \overline{w}z}{1 - z}\right)$ is purely real, then the set of values of z is

A. $\{z : |z| = 1\}$

B. $\{z : z = \bar{z}\}$

C. $\{z : z \neq 1\}$

D. $\{z : |z| = 1, z \neq 1\}$

Answer: D

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48. A man walks a distance of 3 units from the origin towards the North-East $(N45^0 E)$ direction.From there, he walks a distance of 4 units towards the North-West $(N45^0 W)$ direction to reach a point P. Then, the position of P in the Argand plane is $3e^{\frac{i\pi}{4}} + 4i$ (b) $(3-4i)e^{\frac{i\pi}{4}}$ $(4+3i)e^{\frac{i\pi}{4}}$ (d) $(3+4i)e^{\frac{i\pi}{4}}$

A. $3e^{\frac{i\pi}{4}} + 4i$

B. $(3-4i)e^{\frac{i\pi}{4}}$

C. $(4+3i)^{\frac{i\pi}{4}}$

D. $(3+4i)e^{\frac{i\pi}{4}}$

Answer: D

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49. If $|z| = 1 and z \neq \pm 1,$ then all the values of $\frac{z}{1-z^2}$ lie on a line not passing through the origin $|z| = \sqrt{2}$ the x-axis (d) the y-axis

A. a line not passing through origin

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

C. the x-axis

D. the y-axis

Answer: D

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50. If $|z+4| \leq 3$, then the maximum value of $|z+1|$ is (1) 4 (B) 10 (3) 6 (4) 0

A. 10

B. 6

C. 0

D. 4

Answer: B

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51. The conjugate of a complex number is $\frac{1}{i-1}$. Then the complex number is

A. $\frac{1}{i-1}$

B. $\frac{-1}{i-1}$

C. $\frac{1}{i+1}$

D. $\frac{-1}{i+1}$

Answer: D

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52. If $\left|z-\frac{4}{z}\right|=2$, then the maximum value of $|z|$

A. $\sqrt{3}+1$

B. $\sqrt{5}+1$

C. 2

D. $2+\sqrt{2}$

Answer: B

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53. Let $z=x+iy$ be a complex number, where x and y are integers. Then the area of the rectangle whose vertices are the roots of the equation $\bar{z}z^3+z\bar{z}^3=350$ is

A. 48

B. 32

C. 40

D. 80

Answer: A

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54. If $\cos\alpha + \cos\beta + \cos\gamma = \sin\alpha + \sin\beta + \sin\gamma = 0$, then

A. $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = 0$

B. $\sin 2\alpha + \sin 2\beta + \sin 2\gamma = 0$

C. $\cos(\beta + \gamma) + \cos(\gamma + \alpha) + \cos(\alpha + \beta) = 0$

D. $\sin(\beta + \gamma) + \sin(\gamma + \alpha) + \sin(\alpha + \beta) = 0$

Answer: A::B::C::D

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55. Let $A_0A_1A_2A_3A_4A_5$ be a regular hexagon inscribed in a circle of unit radius. Then the product of the lengths of the segments A_0A_1, A_0A_2 and A_0A_4 is

A. $\frac{3}{4}$

B. $3\sqrt{3}$

C. 3

D. $\frac{3\sqrt{3}}{2}$

Answer: C

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56. If z and w are two non-zero complex numbers such that $|zw| = 1$ and $arg(z) - arg(w) = \frac{\pi}{2}$, then $\bar{z}w$ is equal to

A. -1

B. i

C. $-i$

D. 1

Answer: C

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57. If $z^2+z+1=0$, where z is a complex number, then the value of $\left(z+\frac{1}{z}\right)^2+\left(z^2+\frac{1}{z^2}\right)^2+\left(z^3+\frac{1}{z^3}\right)^2+....+\left(z^6+\frac{1}{z^6}\right)^2$ is

A. 18

B. 54

C. 6

D. 12

Answer: D

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58. Let $z = \cos\theta + i\sin\theta$. Then the value of $\sum_{m-1}^{15} Im\left(z^{2m} - 1\right)$ at $\theta = 2^\circ$ is

A. $\dfrac{1}{\sin 2^\circ}$

B. $\dfrac{1}{3\sin 2^\circ}$

C. $\dfrac{1}{2\sin 2^\circ}$

D. $\dfrac{1}{4\sin 2^\circ}$

Answer: D

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1. The number of complex numbers z such that $|z-1| = |z+1| = |z-i|$ equals

A. 0

B. 1

C. 2

D. ∞

Answer: B

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2. If α and β are the root of the equation $x^2 - x + 1 = 0$ then $\alpha^{2009} + \beta^{2009} =$

A. -2

B. -1

C. 1

D. 2

Answer: C

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3. Let z_1 and z_2 be two distinct complex numbers and let $z = (1-t)z_1 + tz_2$ for some real number t with $0 < t < 1$. If Arg(w) denotes the principal argument of a non zero complex number w, then

A. $|z - z_1| + |z - z_2| = |z_1 - z_2|$

B. Arg$|z - z_1| = Arg|z - z_2|$

C. $\begin{vmatrix} z - z_1 & \bar{z} - \bar{z}_1 \\ z_2 - z_1 & \bar{z}_2 - \bar{z}_1 \end{vmatrix} = 0$

D. $Arg(z - z_1) = Arg(z_2 - z_1)$

Answer: A::C::D

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4. Let α, β be real and z be a complex number. If $z^2 + \alpha z + \beta = 0$ has two distinct roots on the line Re.$z = 1$, then it is necessary that

A. $\beta \in (0, 1)$

B. $\beta \in (-1, 0)$

C. $|\beta| = 1$

D. $\beta \in (1, \infty)$

Answer: D

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5. If $(\omega \neq 1)$ is a cube root of unity and $(1+\omega)^7 = A + B\omega$. Then (A, B) equals

A. $(0, 1)$

B. $(1, 1)$

C. $(1, 0)$

D. $(-1, 1)$

Answer: B

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

A. either on the real axis or on a circle passing through the origin

B. on a circle with centre at the origin

C. either on the real axis or on a circle not passing through the origin

D. on the imaginary axis

Answer: A

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7. Let z be a comples number such that the imaginary part of z is non-zero and $a = z^2 + z + 1$ is real. Then a cannot take the value :

A. -1

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. $\frac{3}{4}$

Answer: D

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

A. $\frac{\pi}{2}-\theta$

B. θ

C. $\pi-\theta$

D. $-\theta$

Answer: B

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9. If z is a complex number such that $|z| \geq 2$, then the minimum value of $\left|z+\frac{1}{2}\right|$.

A. lies in the interval $(1, 2)$

B. is strictly greater than $\frac{5}{2}$

C. is strictly greater than $\frac{3}{2}$ but less than $\frac{5}{2}$

D. is equal to $\frac{5}{2}$

Answer: A

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10. A complex number z is said to be the 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

A. straight line parallel to x-axis

B. straight line parallel to y-axis

C. circle of radius 2

D. circle of radius $\sqrt{2}$

Answer: C

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Questions From Karnataka Cet Comed

1. If $2x = -1 + \sqrt{3}i$, then the value of $\left(1 - x^2 + x\right)^6 - \left(1 - x + x^2\right)^6 =$

A. 32

B. -64

C. 64

D. 0

Answer: D

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2. If $(1+i)(1+2i)(1+3i)\ldots\ldots(1+ni)=x+iy,$ then $2.5.10\ldots\ldots\ldots\left(1+n^2\right)=$

A. 0

B. 1

C. $1+n^2$

D. x^2+y^2

Answer: D

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3. If $1, \omega, \omega^2$ are the cube roots of unity then : $(1+\omega)\left(1+\omega^2\right)\left(1+\omega^4\right)\left(1+\omega^8\right)$ is

A. 0

B. 1

C. ω

D. ω^2

Answer: B

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4. The modulus and amplitude of $\dfrac{1+2i}{1-(1-i)^2}$ are respectively

A. $1, \dfrac{\pi}{3}$

B. $\sqrt{2}, \dfrac{\pi}{6}$

C. $1, 0$

D. $\sqrt{3}, 0$

Answer: C

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5. The maximum value of $|z|$ when z satisfies the condition $\left|z+\frac{2}{z}\right|=2$ is

A. $\sqrt{3}-1$

B. $\sqrt{3}+2$

C. $\sqrt{3}+1$

D. $\sqrt{3}$

Answer: C

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6. If z is a complex number with $|z|=1$ and $z+\frac{1}{z}=x+iy$, then $xy=$

A. 0

B. 1

C. 2

D. cannot be found

Answer: A

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7. Among the complex numbers, z satisfying $|z+1-i| \leq 1$, the number having the least positive argument is :

A. $1-i$

B. $-1+i$

C. i

D. $-i$

Answer: C

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8. The maximum value of $n < 101$ such that $1+\sum_{k=1}^{n} i^k = 0$ is

A. 96

B. 97

C. 99

D. 100

Answer: C

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9. The argument of the complex number $\sin\left(\frac{6\pi}{5}\right)+i\left(1+\cos.\ \frac{6\pi}{5}\right)$ is

A. $\frac{\pi}{10}$

B. $\frac{5\pi}{6}$

C. $\frac{-\pi}{10}$

D. $\frac{2\pi}{5}$

Answer: C

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10. The value of $\left(-1+\sqrt{3}\right)^{62}+\left(-1-\sqrt{-3}\right)^{62}$ is

A. 2^{62}

B. 2^{-62}

C. -2^{62}

D. 0

Answer: C

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11. All complex numers z, which satisfy the equation $\left|\frac{z-i}{z+i}\right|=1$ lie on the

A. imaginary axis

B. real axis

C. neither of the axes

D. None of these

Answer: B

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12. If α and β two different complex numbers with $|\beta| = 1$, then $\left|\frac{\beta - \alpha}{1 - \overline{\alpha}\beta}\right|$ is equal to

A. 0

B. 1

C. $\frac{1}{2}$

D. -1

Answer: B

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13. Amplitude of the complex number $i\sin\left(\frac{\pi}{19}\right)$ is

A. $\frac{\pi}{19}$

B. $-\frac{\pi}{19}$

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

D. $\frac{\pi}{2}-\frac{\pi}{19}$

Answer: C

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14. If $1, \omega, \omega^2$ are three cube roots of unity, then $\left(1-\omega+\omega^2\right)\left(1+\omega-\omega^2\right)$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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15. If $z=\frac{\left(\sqrt{3}+i\right)^{3}(3i+4)^{2}}{(8+6i)^{2}}$, then |z| is equal to

A. 0

B. 1

C. 2

D. 3

Answer: C

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