MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

COMPLEX NUMBERS AND DE MOIVRE'S THEOREM

Problems

1. If α, β are the roots of the equation $x^2 - 4x + 8 = 0.$ Them for any $n \in N, \alpha^{2n} + \beta^{2n}$ equals

A. $2^{2n+1}\cos\frac{n\pi}{2}$

B. $2^{3n}\cos\frac{n\pi}{2}$

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

D. $2^{3n}\cos\frac{n\pi}{4}$

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2. If α, β are the non-real cube roots of 2, then

$\alpha^6 + \beta^6 =$

A. 8

B. 4

C. 2

D. 1

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3. If $'\omega'$ is a complex cube root of unity, then

$$\omega^{\left(\frac{1}{3}+\frac{2}{9}+\frac{4}{27}+\dots\infty\right)}+\omega^{\left(\frac{1}{2}+\frac{3}{8}+\frac{9}{32}+\dots\infty\right)}=$$

A. 1

B. -1

C. ω

D. i

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4. $\left(\frac{1+\cos\frac{\pi}{8}+i\sin\frac{\pi}{8}}{1+\cos\frac{\pi}{8}-i\sin\frac{\pi}{8}}\right)^{8}=$

A. 1

B. -1

C. 2

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

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5. The number of solutions for $z^{3}+\bar{z}=0$ is

A. 5

B. 1

C. 2

D. 3

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6. The least positive integer n for which $(1+i)^n = (1-i)^n$. is

A. 8

B. 2

C. 4

D. 6

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7. If $x = p + q, y = p\omega + q\omega^2$ and $z = p\omega^2 + q\omega$, where ω is a complex cube root of unity, then xyz equals to

A. $p^3 + q^3$

B. $p^2 - pq + q^3$

C. $1 + p^3 + q^3$

D. $p^3 - q^3$

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8. $\left(\frac{1+i}{1-i}\right)^4 + \left(\frac{1-i}{1+i}\right)^4 =$

A. 0

B. 1

C. 2

D. 4

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9. If a complex number z satisfies $|z|^2 + 1 = |z^2 - 1|$, then the locus of z is

A. the real axis

B. the imaginary axis

C. y = x

D. a circle

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10.

$$\frac{(1+i)x-i}{2+i}+\frac{(1+2i)y+i}{2-i}=1 \Rightarrow (x, y)=$$

A. $\left(\frac{7}{3}, \frac{-7}{15}\right)$

B. $\left(\frac{7}{3}, \frac{7}{15}\right)$

C. $\left(\frac{7}{5}, \frac{-7}{15}\right)$

D. $\left(\frac{7}{5}, \frac{7}{15}\right)$

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11. If $a, b, c, d \in \mathbb{R}$ are such that $a^2 + b^2 = 4$ and $c^2 + d^2 = 2$ and if $(a + ib)^2 = (c + id)^2 (x + iy)$ then $x^2 + y^2 =$

A. 4

B. 3

C. 2

D. 1

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12. If α is a non real root of the equation $x^6 - 1 = 0$ then $\dfrac{\alpha^2 + \alpha^3 + \alpha^4 + \alpha^5}{\alpha + 1}$

A. α

B. 1

C. 0

D. -1

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13. Let

$$z = a - \frac{i}{2}, a \in \mathbb{R} \text{ Then } |i + z|^2 - |i - z|^2 =$$

A. 2

B. -2

C. 4

D. -4

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14. The locus of the complex number z such that $\arg\left(\frac{z-2}{z+2}\right)=\frac{\pi}{3}$ is :

A. a circle

B. a straight line

C. a parabola

D. an ellipse

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15. $\frac{(1+i)^{2011}}{(1-i)^{2009}}=$

A. -1

B. 1

C. 2

D. -2

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16. $z=1+i\sqrt{3} \Rightarrow |Argz|+|Arg\bar{z}|=$

A. 0

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

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

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

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17. If ω is a complex cube root of unity, then $(x+1)(x+\omega)(x-\omega-1)$

A. x^3-1

B. x^3+1

C. x^3+2

D. x^3-2

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18. The locus of z satisfying the $\left|\frac{x+2i}{2z+i}\right|<1$, inequality where $z=x+iy$, is

A. $x^2+y^2<1$

B. $x^2-y^2<1$

C. $x^2 + y^2 > 1$

D. $2x^2 + 3y^2 < 1$

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19. The points in the set $\left\{z \in C : Arg\left(\frac{z-2}{Z-6i}\right) = \frac{\pi}{2}\right\}$ lie on the curve which is a (where C denotes the sets of all complex number)

A. Circle

B. Pair of lines

C. Parabola

D. Hyperbola

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20. If ω is a complex cube root of unity, then $\sin\left[\left(\omega^{10}+\omega^{23}\right)\pi-\frac{\pi}{4}\right]$

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

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

C. 1

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

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21. If m_1, m_2, m_3 and m_4 respectively denote the moduli of the complex numbers $1+4i, 3+i, 1-i$ and $2-3i$, then the correct one, among the following is

A. $m_1 < m_2 < m_3 < m_4$

B. $m_4 < m_3 < m_2 < m_1$

C. $m_3 < m_2 < m_4 < m_1$

D. $m_3 < m_1 < m_2 < m_4$

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22. The locus of the point $z = x + iy$ satisfying $\left|\frac{z-2i}{z+2i}\right| = 1$ is

A. x-axis

B. y-axis

C. y = 2

D. x = 2

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23. The equation of the locus of 2 such that $\left|\frac{z-i}{z+i}\right| = 2$, where z = x + iy is a complex number , is

A. $3x^2 + 3y^2 + 10y - 3 = 0$

B. $3x^2 + 3y^2 + 10y + 3 = 0$

C. $3x^2 - 3y^2 - 10y - 3 = 0$

D. $x^2 + y^2 - 5y + 3 = 0$

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24. If $\alpha_1, \alpha_2, \alpha_3$ respectively denote the moduli of the complex number $-i, \frac{1}{3}(1+i)$ and $-1+i$, then their increasing order is

A. $\alpha_1, \alpha_2, \alpha_3$

B. $\alpha_3, \alpha_2, \alpha_1$

C. $\alpha_2, \alpha_1, \alpha_3$

D. $\alpha_3, \alpha_1, \alpha_2$

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25. $\sum_{n=0}^{\infty}\left(\frac{2i}{3}\right)^n =$

A. $\frac{9+6i}{13}$

B. $\frac{9-6i}{13}$

C. $9 + 6i$

D. $9 - 6i$

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26. If $X_n = \cos\frac{\pi}{2^n} + i\sin\frac{\pi}{2^n}$, then $x_1, x_2, x_3 \dots \infty$

A. -1

B. 1

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

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

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27. If the amplitude of $z-2-3i$ is $\pi/4$, then the locus of z = x +iy is

A. $x+y-1=0$

B. $x-y-1=0$

C. $x+y+1=0$

D. $x-y+1=0$

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28. If ω is a complex cube root of unity, then

$225+\left(3\omega+8\omega^2\right)^2+\left(3\omega^2+8\omega\right)^2$

A. 72

B. 192

C. 200

D. 248

29. If $z = x + iy$ is a complex number satisfying $|z + i/2|^2 = |z - i/2|^2$ then the locus of z is

A. x-axis

B. y-axis

C. y = x

D. 2y = x

30. If $1 - i$ is a root of the equation $x^2 + ax + b = 0$, then b is equal to

A. 1

B. -1

C. -2

D. 2

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31. If $x_n = \cos\left(\frac{\pi}{4^n}\right) + i\sin\left(\frac{\pi}{4^n}\right)$, then $x_1, x_2, x_3 .... \infty$ is equal to

A. $\frac{1+i\sqrt{3}}{2}$

B. $\frac{-1+i\sqrt{3}}{2}$

C. $\frac{1-i\sqrt{3}}{2}$

D. $\frac{-1-i\sqrt{3}}{2}$

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32. If $\frac{3+2i\sin\theta}{1-2i\sin\theta}$ is a real number and 0 < θ< 2π, then θ=

A. π

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

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

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

33. If $z = 3 + 5i$ then $z^3 + \bar{z} + 198$ is equal to

A. $-3 - 5i$

B. $-3 + 5i$

C. $3 - 5i$

D. $3 + 5i$

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34. If $\begin{vmatrix} 1-i & i \\ 1+2i & -i \end{vmatrix} = x + iy$, then x is equal to

A. -2

B. -1

C. 1

D. 2

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