MATHS

BOOKS - BITSAT GUIDE

COMPLEX NUMBERS

Practice Exercise

1. The multiplicative inverse of $(6+5i)^2$ is

A. $\frac{11}{61}-\frac{60}{61}I$

B. $\frac{11}{61}+\frac{60}{61}I$

C. $\frac{9}{61}-\frac{60}{61}I$

D. None

Answer: D

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2. If $8iz^3 + 12z^2 - 18z + 27i = 0,$ then the vale of |z| is

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

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

C. 1

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

Answer: A

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3. If z_1 and z_2 are two complex numbers such that $|z_1| = |z_2|$and arg $(z_1) +$ arg $(z_2) = \pi,$ then z_1 is equal to

A. $2\overrightarrow{z}_2$

B. $\overrightarrow{z}_2$

C. $-\overrightarrow{z}_2$

D. None of these

Answer: C

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4. If $|z-1|=1,$ then arg (z) is equal to

A. $\frac{1}{2}arg(z)$

B. $\frac{1}{3}arg(z+1)$

C. $\frac{1}{2}arg(z-1)$

D. None of these

Answer: C

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5. If $z_1 = 8 + 4i,\ z_2 = 6 + 4i$ and $arg\left(\frac{z - z_1}{z - z_2}\right) = \frac{\pi}{4}$, then z satisfies

A. $|z - 7 - 4i| = 1$

B. $|z - 7 - 5i| = \sqrt{2}$

C. $|z - 4i| = 8$

D. $|z - 7i| = \sqrt{18}$

Answer: B

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6. If z_1, z_2 and z_3 are three complex numbers such that $|z_1| = |z_2| = |z_3| = \left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_2}\right| = 1,$ then $|z_1 + z_2 + z_3|$ is

A. equal to 1

B. equal than 1

C. greater than 3

D. equal to 3

Answer: A

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7. If $1, \omega$ and ω^2 are the three cube roots of unity and α, β and γ are the cube roots of $p, q(<0)$, then for any x, y and z, the expression $\left(\frac{x\alpha + y\beta + z\gamma}{x\beta + y\gamma + z\alpha}\right)$ is equal to

A. 1

B. ω

C. ω^2

D. None of these

Answer: C

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8. If $\begin{vmatrix} x+1 & \omega & \omega^2 \\ x+\omega & \omega^2 & 1 \\ x+\omega^2 & 1 & \omega \end{vmatrix} = 3$ is an equation of x, where 1, ω and ω^2 are the complex cube roots of unity. Then, the value of x is

A. 0

B. 1

C. -1

D. None of these

Answer: D

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

A. 0

B. 1

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

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

Answer: B

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10. If $z = 1 + \cos\frac{\pi}{5} + I\sin\frac{\pi}{5},$ then sin (areg z) si equal to

A. $\frac{\sqrt{10 - 2\sqrt{5}}}{4}$

B. $\frac{\sqrt{5} - 1}{4}$

C. $\frac{\sqrt{5} + 1}{4}$

D. $\frac{\sqrt{2} - 1}{4}$

Answer: B

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11. If $Re\left(\frac{1}{z}\right) = 3,$ then z lies on

A. circle with centre on Y-axis

B. circle with centre on X-axis not passing through origin

C. circle with centre on X-axis passing through origin

D. None of the above

Answer: C

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12. If a complex number z lies in the interior or on the boundary of a circle of radius 3 and centre at $(5) - 4, 0$ then the greatest and least values of ` z + 1 are

A. $5, 0$

B. $6, 1$

C. $6, 0$

D. None of these

Answer: C

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13. If arg $\left(\vec{z}_1\right) = arg(z_2)$. then

A. $z_2 = kz_1^{-1}(k > 0)$

B. $z_2 = kz_1(k > 0)$

C. $|z_2| = \left|\vec{z}_1\right|$

D. None of these

Answer: D

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14. If z_1 and z_2 are two complex numbers such that $\frac{z_1}{z_2} + \frac{z_2}{z_1} = 1$, then

A. z_1, z_2 are collinear

B. z_1, z_2 and the origin form a right angled triangle

C. z_1, z_2 and the origin form an equilateral triangle

D. None of the above

Answer: C

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15. If z_1, z_2 and z_3, z_4 are two pairs of conjugate complex numbers, then arg $\left(\frac{z_1}{z_4}\right) + arg\left(\frac{z_2}{z_3}\right)$ is equal to

A. 0

B. $\pi/2$

C. $3\pi/2$

D. π

Answer: A

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16. If

$a=\cos\alpha+i\sin\alpha, b=\cos\beta+i\sin\beta, c=\cos\gamma+i\sin\gamma$ and $\frac{b}{c}+\frac{c}{a}+$

then $\cos(\beta-\gamma)+\cos(\gamma-\alpha)+\cos(\alpha-\beta)$ is equal to

A. $3/2$

B. $-3/2$

C. 0

D. 1

Answer: D

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17. The least positive integer n for which

$\left(\frac{1+i}{1-i}\right)^n=\frac{2}{\pi}\left(\sec^{-1}\frac{1}{x}+\sin^{-1}x\right)$, where $x\neq 0, \ -1\leq x\leq 1$, is

A. 2

B. 4

C. 6

D. 8

Answer: B

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18. If $z = \sqrt{(5 + 12i)} + \sqrt{(12i - 5)}$, then the principal value of arg (z) can be

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

B. $-\frac{\pi}{4}$

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

D. All of these

Answer: D

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19. If $arg\left(\frac{2-z}{2+z}\right)=\frac{\pi}{6},$ then locus of z is

A. straight line

B. circle

C. parabola

D. None of these

Answer: B

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20. If $z_r = cis\frac{\pi}{2},$ then $z_1 z_2 \ldots$ is equal to

A. 1

B. -1

C. -2

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

Answer: B

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21. If z_1, z_2 and z_3 represent the vertices of an equilateral triangle such that

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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22. For any two complex numbers z_1 and $z_2,$ we have $|z_1 + z_2|^2 = |z_2|^2 + |z_2|^2,$ then

A. $Re\left(\frac{z_1}{z_2}\right) = 0$

B. $lm\left(\frac{z_1}{z_2}\right) = 0$

C. $Re\left(\frac{z_1}{z_2}\right) \neq 0$

D. None of these

Answer: D

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

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

B. 1

C. 2

D. None

Answer: B

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24. The value of sum $\sum_{n=1}^{13}\left(i^n + i^{n+1}\right)$ where $i = \sqrt{-1}$, is equal to

A. i

B. $i - 1$

C. $-i$

D. 0

Answer: B

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25. The continued product of the four values of $\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)^{3/4}$ is

A. -1

B. 1

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

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

Answer: B

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26. If $x_n = \cos\left(\frac{\pi}{2^n}\right) + i\sin\left(\frac{\pi}{2^n}\right), n \in N,$ then $x_1x_2x_3...$ is equal to

A. 1

B. -1

C. zero

D. None

Answer: B

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27. If $\alpha = i\beta = \cot^{-1}(z)$, where z = x + iy and α is a constant then the locus of z is

A. $x^2 + y^2 - x\cot 2\alpha - 1 = 0$

B. $x^2 + y^2 - 2x\cot\alpha - 1 = 0$

C. $x^2 + y^2 - 2x\cot 2\alpha + 1 = 0$

D. $x^2 + y^2 - 2x\cot 2\alpha - 1 = 0$

Answer: D

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

A. $\frac{B}{A}$

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

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

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

Answer: C

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29. The maximum value of $|z|$, when z satisfy the condition $\left|z+\frac{3}{z}\right|=3$ is

A. $\frac{2-\sqrt{21}}{2}$

B. $\frac{3-\sqrt{20}}{2}$

C. $\frac{3+\sqrt{21}}{2}$

D. $\frac{3+\sqrt{20}}{2}$

Answer: C

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30. If $i=\sqrt{-1}$ then $4+5\left(-\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)^{334}+3\left(-\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)^{365}$ is equal to to

A. $1-i\sqrt{3}$

B. $-1+\sqrt{3}$

C. $i\sqrt{3}$

D. $-i\sqrt{3}$

Answer: C

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31. Let $z=a+ib+(a,b)$ be any complex number, $\forall a,b, \in R$ and $i=\sqrt{-1}.$ If $(a,b)\neq(0,0),$ then $are(z)=\tan^{-1}\left(\frac{b}{a}\right),$ where arg $(z)\leq\pi$

If $arg(z)>0,$ then $arg(-z)-arg(z)=\lambda_1$ and if arg (z) $<0,$ then arg (z)- arg $(-z)=\lambda_2,$ where

A. $\lambda_1 + \lambda_2 = 0$

B. $\lambda_2 - \lambda_2 = 0$

C. $3\lambda_1 - 2\lambda_2 = 0$

D. $2\lambda_1 - 3\lambda_2 = 0$

Answer: B

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32. Let $z = a + ib + (a, b)$ be any complex number, $\forall a, b, \in R$ and $i = \sqrt{-1}.$ If $(a, b) \neq (0, 0)$, then $are(z) = \tan^{-1}\left(\frac{b}{a}\right)$, where arg $(z) \leq \pi$

The value of $\sqrt{\{arg(z) + arg(-\bar{z}) - 2\pi\}\{arg(-z) + arg(\bar{z})\}}$, $\forall z = x + iy,$ where $i = \sqrt{-1}, x, y > 0,$ is

A. π

B. $-\pi$

C. 0

D. not difined

Answer: A

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33. 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 triangle

C. equilateral

D. obtuse angled triangle

Answer: C

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34. 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

A. $4k+1$

B. $4k+2$

C. $4k+3$

D. $4k$

Answer: D

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35. The value of $\begin{vmatrix} 1+\omega & (\omega^2) & 1+\omega^2 \\ -\omega & -(1+\omega^2) & 1+\omega \\ -1 & -(1+\omega^2) & 1+\omega \end{vmatrix}$, where $\omega$is cube root of unity, is equal to

A. 2ω

B. $2\omega^2$

C. $-3\omega^2$

D. 3ω

Answer: C

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36. Find the square root of 7+24i

A. $3 \pm (4 + 3i)$

B. $\pm(4 - 3i)$

C. $\pm(3 + 4i)$

D. $\pm(3 - 4i)$

Answer: A

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37. If $|z_1| = |z_2|$ and $arg\left(\frac{z_1}{z_2}\right) = \pi$, then $z_1 + z_2$ is equal to

A. 0

B. purely imagninary

C. purely real

D. None of these

Answer: A

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38. If $\left(\frac{1-i}{1+i}\right) = a + ib$, then

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39. 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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40. Let z_1 and z_2 be two complez number such that $z_1 \neq z_2$ and $|z_1| = |z_2|. If z_1$ has positive real part and z_2 has negative imaginary part, then $\frac{(z_1 + z_2)}{(z_1 - z_2)}$ may be

A. purely imaginary

B. real and positive

C. real and negative

D. None of the above

Answer: A

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Bitset Archives

1. The complex number z =x+iy which satisfies the equation $\left|\frac{z-3i}{z+3i}\right|=1,$ then on

A. the X-axis

B. the straight line y = 3

C. a circle passing through origin

D. None of the above

Answer: A

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

A. -1

B. 0

C. $-i$

D. i

Answer: D

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3. If $(x+iy)^{1/3}=2+3i,$ then $3x+2y$ is equal to

A. -20

B. -60

C. -120

D. 60

Answer: C

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4. Area of the triangle in the argand diagram formed by the complex numbers z, iz, z +iz , where z = x+iy , is

A. $|z|$

B. $|z|^2$

C. $2|z|^2$

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

Answer: D

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5. If $z = \cos\theta + I\sin\theta,$ then the value of $z^n + \frac{1}{z^4}$ will be

A. $\sin 2n\theta$

B. $2\sin n\theta$

C. $2\cos n\theta$

D. $\cos 2n\theta$

Answer: C

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6. Find the least value of n for which $\left(\frac{1+i}{1-i}\right)^n = 1.$

A. 4

B. 3

C. -4

D. 1

Answer:

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7. If ω is cube root of unity, then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is equal to

A. 1

B. ω

C. ω^2

D. 0

Answer: D

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8. If $a = \cos\theta + i\sin\theta$, then $\frac{1+a}{1-a}$ is equal to

A. $\cot\left(\frac{\theta}{2}\right)$

B. $\cot\theta$

C. $i\cot\frac{\theta}{2}$

D. $i \tan \frac{\theta}{2}$

Answer: C

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

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

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

C. 1

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

Answer: A

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10. If $(\cos\theta + i\sin\theta)(\cos 2\theta + i\sin 2\theta)....$

$(\cos n\theta + i\sin\theta) = 1,$ then the value of θ is

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

B. $4m\pi$

C. $\frac{4m\pi}{n(n+1)}$

D. $\frac{m\pi}{n(n+1)}$

Answer: C

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

A. 4

B. 3

C. 1

D. 2

Answer: D

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12. The amplitude of $\frac{1+i\sqrt{3}}{\sqrt{3}+i}$ is

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

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

C. 0

D. None of these

Answer: A

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13. Let $x=\alpha+\beta$, $y=\alpha\omega+\beta\omega^2$, $z=\alpha\omega^2+\beta\omega$, ω being an imaginary cube root of unity. Product of xyz is

A. $\alpha^2+\beta^2$

B. $\alpha^2-\beta^2$

C. $\alpha^3+\beta^3$

D. $\alpha^3-\beta^3$

Answer: C

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