MATHS

BOOKS - NEW JYOTHI MATHS (TAMIL ENGLISH)

COMPLEX NUMBERS AND QUADRATIC EQUATIONS

Examples

1. For any two complex numbers z_1 and z_2 prove that

(i) $Re(z_1z_2)=Re(z_1)Re(z_2)-Im(z_1)Im(z_2)$.

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2. Express the complex number

(i) i^9+i^{19}

(ii) i^{-39} in the form $a+ib$.

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3. Express $\left(\frac{1}{3}+3i\right)^3$ in the form $a+ib$.

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4. Consider the complex number $z=1+i+i^2+i^4$

(i) Write z in the form $a+ib$.

(ii) Find the conjugate of z.

Find z^2.

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5. Find the multiplicative inverse of $4-3i$.

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6. Find the multiplicative inverse of $-i$.

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7. Find the real part of $\frac{1}{1+i}$.

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8. Express the complex number $\frac{3-\sqrt{-16}}{1-\sqrt{-9}}$ in the form $a+ib$.

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9. Express the complex number $\frac{2-i}{(1-i)(1+2i)}$ in the form $a+ib$.

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10. If $\frac{5+6i}{3+4i}=a+ib$, find a+b.

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11. Simplify $\frac{(3i+2)(2-i)^2}{3+i}$ and find the conjugate.

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12. If $z_1 = 3+4i \quad \text{and} \quad z_2 = 2-i$, verify that $|z_1 z_2| = |z_1||z_2|$.

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13. (i) Express $(6+5i)^2$ in the form $a+ib$.

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14. Find real x such that $\frac{3+2i\sin x}{1-2i\sin x}$ is purely real.

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15. Express the following expression in the form of $a + ib$, $\frac{\left(3 + i\sqrt{5}\right)\left(3 - i\sqrt{5}\right)}{\left(\sqrt{3} + \sqrt{2}i\right) + \left(\sqrt{3} - \sqrt{2}i\right)}$

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16. Plot the points corresponding to $2 - 3i, 2 + 3i, 3 - 2i, 3 + 2i, \; -3 + 2i$ and $-3 - 2i$ on the same Argand plane.

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17. For any two complex numbers z_1 and z_2 prove that $Im(z_1 z_2) = Re(z_1)Im(z_2) + Im(z_1)Re(z_2)$.

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18. Find the polar form of the following complex numbers.

(i) $1 + i$

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19. Find the polar form of the complex number $\sqrt{3} + i$.

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20. Consider the complex number $z = \dfrac{2 + i}{(1 + i)(1 - 2i)}$

(i) Express z in the form $a + ib$.

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21. Express the complex number $z = \dfrac{5 + i}{2 + 3i}$ in the form $a + ib$.

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22. Express $\frac{1}{1-i}$ in the form $a+ib$.

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23. (i) If $i=\sqrt{-1}$, find the sum of $i+i^2+i^3+\ldots\ldots..i^{99}$

(ii) Convert $\frac{1-i}{\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}}$ into

(a) $a+ib$

(b) polar form.

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24. Consider the complex number $z=1+i\sqrt{3}$

(i) Find $|z|$

(iii) Express $\frac{1}{z}$ in the form $a+ib$.

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25. Solve the equation $x^2 + 1 = 0$.

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26. Solve $2x^2 - \sqrt{3}x + 2 = 0$.

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27. Solve the equation $ix^2 - x + 12i = 0$.

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28. Consider the equation $z^2 - 2z + 4 = 0$.

(i) Find two complex numbers z_1 and z_2 satisfying the above equation.

(ii) Simplify $\frac{z_1}{z_2} + \frac{z_2}{z_1}$.

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29. Evaluate $\left[i^{18} + \left(\frac{1}{i}\right)^{25}\right]^2$.

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30. If $x - iy = \sqrt{\frac{a - ib}{c - id}}$, prove that $x^2 + y^2 = \frac{a^2 + b^2}{c^2 + d^2}$.

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31. If $z_1 = 2 - i,\ z_2 = 1 + i$, find $\left|\frac{z_1 + z_2 + 1}{z_1 - z_2 + 1}\right|$.

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32. If $a + ib = \frac{(x + i)^2}{2x^2 + 1}$, prove that $a^2 + b^2 = \frac{(x^2 + 1)^2}{(2x^2 + 1)^2}$

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33. Let $z_1 = 2 - i, z_2 = -2 + i$. Find

(i) $Re\left(\frac{z_1 z_2}{z_1}\right)$

(ii) $Im\left(\frac{1}{z_1 z_2}\right)$.

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34. Find the modulus and argument of the complex number $\frac{1+2i}{1-3i}$.

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35. Find the real numbers x and y if $(x - iy)(3 + 5i)$ is the conjugate of $-6 - 24i$.

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36. Find the modulus of $\frac{1+i}{1-i} - \frac{1-i}{1+i}$.

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37. If $(x+iy)^3 = u+iv$, then show that $\frac{u}{x}+\frac{v}{y}=4\left(x^2-y^2\right)$.

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38. If α and β are complex numbers such that $|\beta|=1$, then $\left|\frac{\beta-\alpha}{1-\overline{\alpha}\beta}\right| =$

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39. Find the numbers of non-zero integral solutions of the equation $|1-i|^x = 2^x$

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40. If w is a non real cube of unity, then $(a+b)(a+bw)\left(a+bw^2\right) =$

A. a^3+b^3

B. $a^3 - b^3$

C. $a^2 + b^2$

D. $a^2 - b^2$

Answer:

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

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Exercise

1. formula for Modulus of a complex number is

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2. $\bar{z} = z$ if and only if z is a

A. real number

B. non negative real number

C. natural number

D. purely imaginary number

Answer: A

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3. $\bar{z} = -z$ if and only if z is a

A. real number

B. non negative real number

C. positive real number

D. purely imaginary number

Answer: D

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4. arg z=0 if and only if z is a

A. purely imaginary number

B. positive integer

C. positive real number

D. non negative real number

Answer: C

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5. arg $z = \pi$ if and only if z is a

A. purely imaginary number

B. positive real number

C. negative real number

D. non negative real number

Answer: C

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6. arg $z = \frac{\pi}{2}$ if and only if z is a

A. purely imaginary number

B. purely imaginary number with positive imaginary part

C. positive real number

D. negative real number

Answer: B

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7. arg $z = \frac{-\pi}{2}$ if and only if z is a

A. purely imaginary number

B. purely imaginary number with negative imaginary part

C. purely imaginary number with positive imaginary part

D. positive real number

Answer: B

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8. Which of the following is correct

A. $1 + i > 2 + i$

B. $3 + 2i = 2 + 3i$

C. $3 + 2i > 1 - 3i$

D. $5 + 2i < 4 + i$

Answer: C

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9. Let z_1 and z_2 be two complex numbers such that $z_1 z_2$ and $z_1 + z_2$ are real then

A. $z_1 + z_2 = 0$

B. $z_1 - z_2 = 0$

C. $z_1 + \bar{z}_2 = 0$

D. $z_1 - \bar{z}_2 = 0$

Answer: C

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10. Let z be any non zero complex number then $arg z + arg \bar{z} =$

A. π

B. $-\pi$

C. 0

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

Answer: C

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11. The complex number $\frac{2+3i}{3+2i}$ in $a+ib$ form

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12. $i+i^2+i^3+\ldots\ldots\ldots+i^{101}=$

A. 1

B. -1

C. 0

D. i

Answer: D

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13. $i + i^2 + i^3 + i^4$ terms equals

A. 0

B. i

C. $-i$

D. 1

Answer: A

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14. The smallest positive integer 'n' for which $\left(\frac{1+i}{1-i}\right)^n = 1$ is

A. 1

B. 2

C. 4

D. 6

Answer: C

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15. A square root of $5+12i$ is

A. $3+2i$

B. $2+3i$

C. $3-2i$

D. $6+i$

Answer: A

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16. A square root of $-7+24i$ is

A. $4+3i$

B. $3+4i$

C. $b+2i$

D. $2-6i$

Answer: B

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17. $\left|\frac{1+7i}{4+3i}\right|=$

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

B. 2

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

D. $\sqrt{2}$

Answer: D

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18. If x,y,z are real and $x + iy = (x + iz)(x - iy)$ then

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

B. $y^2 + z^2 = 1$

C. $x^2 + z^2 = 1$

D. $x^2 + y^2 = z^2$

Answer: C

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19. $a + ib = (1 + i)(1 + 2i)(1 + 3i)$ then $a^2 + b^2 =$

A. 10

B. 100

C. 25

D. 65

Answer: B

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20. If α and β are complex numbers such that $|\beta| = 1$, then $\left|\dfrac{\beta - \alpha}{1 - \overline{\alpha}\beta}\right| =$

A. 1

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

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

D. $\sqrt{2}$

Answer: A

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21. If $|z_1| = |z_2| = |z_3|.... = |z_n| = 1$ then $|z_1 + z_2 + ... + z_n| =$

A. $|z_1 z_2 z_3 ....z_n|$

B. $\frac{1}{|z_1 z_2 ....z_n|}$

C. $\left|\frac{1}{z_1} + \frac{1}{z_2} + ... + \frac{1}{z_n}\right|$

D. $\left|\frac{1}{z_1 z_2} + \frac{1}{z_2 z_3} + ...\frac{+1}{z_{n-1} z_n}\right|$

Answer: C

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22. If $|z_1 + z_2| = |z_1| + |z_2|$ then

A. $z_1 \text{ and } z_2$ are real

B. $z_1 \text{ and } z_2$ are real and positive

C. $\frac{z_1}{z_2}$ is real

D. $\frac{z_1}{z_2}$ is real and positive

Answer: D

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23. If $|z_1 + z_2| = |z_1| + |z_2|$, then $arg z_1 - arg z_2 =$

A. π

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

C. 0

D. $-\pi$

Answer: C

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24. $|z_1| = |z_2|$ and $arg z_1 + arg z_2 = 0$ then

A. $z_1 = z_2$

B. $z_1 = -z_2$

C. $z_1 = \overline{z_2}$

D. $z_1 = -\overline{z_2}$

Answer: C

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25. If $|z_1 + z_2| = |z_1| + |z_2|$ then

A. 0

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

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

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

Answer: B

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26. If z is a complex number such that $\frac{z-1}{z+1}$ is purely imaginary then $|z| =$

A. 1

B. 2

C. 3

D. 5

Answer: A

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27. If z_1 and z_2 are two complex numbers such that $Im(z_1 + z_2) = 0, Im(z_1 z_2) = 0$ then

A. $z_1 = -z_2$

B. $z_1 = z_2$

C. $z_1 = \overline{z_2}$

D. $z_1 = -\overline{z_2}$

Answer: C

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28. If z_1 and z_2 are two complex numbers such that $\left|\frac{z_1 - z_2}{z_1 + z_2}\right| = 1$ then

A. $z_1 = kz_2, k \in R$

B. $z_1 = ikz_2, k \in R$

C. $z_1 = z_2$

D. $z_1 = \overline{z_2}$

Answer: B

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29. If, $|z+4| \leq 3$, then the maximum value of $|z+1|$ is

A. 5

B. 4

C. 6

D. 3

Answer: C

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30. Fir any complex number z, the minimum value of $|z| + |z-1|$ is

A. 1

B. 0

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

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

Answer: A

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31. If $\left|z-\frac{4}{z}\right|=2$ then the miximum value of $|z|$ is

A. $3+\sqrt{5}$

B. $2+\sqrt{3}$

C. $3+\sqrt{2}$

D. $1+\sqrt{5}$

Answer: D

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32. The least value of $\left|z+\frac{1}{z}\right|$ if $|z|\geq 3$ is

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

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

C. $\frac{7}{9}$

D. $\frac{1}{9}$

Answer: A

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33. The minimum value of $|z-2|+|z-3|$ is

A. 0

B. 1

C. 2

D. 3

Answer: B

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34. The equation $z^2 = \bar{z}$ has

A. no solution

B. two solutions

C. 4 solution

D. infinite solution

Answer: C

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35. Argument of $\frac{1 - i\sqrt{3}}{1 + i\sqrt{3}}$

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

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

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

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

Answer: D

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36. If x,y,a,b,c,d are real and $x+iy=\sqrt{\frac{a+ib}{c+id}}$ then $\left(x^2+y^2\right)^2=$

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

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

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

D. $\frac{a^2+b^2}{(c+d)^2}$

Answer: A

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37. $(1+i)^{16}+(1-i)^{16}$ equals

A. 512

B. 128

C. 256

D. 1024

Answer: A

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38. If $(2+i)(5+i)(8+i) = A + iB$ then $\tan^{-1}\frac{B}{A} =$

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

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

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

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

Answer: C

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39. The argument of the complex number $z = r(\sin\theta + i\cos\theta), r > 0$ is

A. θ

B. $\pi - \theta$

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

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

Answer: D

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40. The triangle formed by the points $3 + 3i, 2 + 2i, 1 + 3i$ in the argand diagram is

A. isosceles

B. equilateral

C. right angled

D. right angled isosceles

Answer: D

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41. The area if the triangle formed by the points z, iz and $z + iz$ is 50 sq. units then $|z| =$

A. 5

B. 10

C. 25

D. 100

Answer: B

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42. If $arg\left(\frac{z-1}{z+1}\right) = \frac{\pi}{3}$ then the of z is

A. circle

B. ellipse

C. triangle

D. straight line

Answer: A

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43. If $|z-1|=2$ then the locus of z is

A. circle

B. ellipse

C. straight line

D. parabola

Answer: A

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44. If $|z-1|=|z-3|$ then the locus of z is

A. A. straight line paralled to x-axis

B. B. straight line through origin

C. C. straight line parallel to imaginary axis

D. D. straight line passing through origin and equally inclined to the axis

Answer: C

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45. $|z-4|<|z-2|$ represents the region given by

A. $Re(z)<3$

B. $Re(z)>3$

C. $Im(z) < 3$

D. $Im(z) > 3$

Answer: B

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46. Argument of $\dfrac{(1+i)\left(\sqrt{3}+i\right)}{\left(i-\sqrt{3}\right)(1-i)}$ is

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

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

C. $\dfrac{-\pi}{6}$

D. $5\dfrac{\pi}{6}$

Answer: C

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47. If $|z+3|^2 - |z-3|^2 = 8$ then the locus of z is

A. straight line parallel to the imaginary axis

B. a straight line parallel to the real axis

C. a straight line passing through the origin

D. a straight line which cut both the axis

Answer: A

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

A. a circle

B. a parabola

C. real axis

D. imaginary axis

Answer: D

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49. The solution of the equation $|z| - z = 1 + 2i$

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

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

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

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

Answer: A

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50. $\left(1 + i\sqrt{3}\right)^{12} - \left(1 - i\sqrt{3}\right)^{12} =$

A. 2^{13}

B. 0

C. 2^{12}

D. $2^{12}i$

Answer: B

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Questions From Competitive Exams

1. If p,q are the roots of $ax^2 - 25x + c = 0$, then $p^3q^3 + p^2q^3 + p^3q^2 =$

A. $\frac{c^2(c+25)}{a^3}$

B. $\frac{c^3(c-25)}{a^3}$

C. $\frac{bc^3}{a^3}$

D. $\frac{bc^2}{a^2}$

Answer: A

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2. If the ratio of roots of $x^2 + bx + c = 0$ and $x^2 + qx + r = 0$ is the same, then

A. $r^2 b = qc^2$

B. $rb^2 = cq^2$

C. $r^2 c = qb^2$

D. $rc^2 = bq^2$

Answer: B

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3. 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. $\left(\frac{1}{2}\right)|z|^2$

Answer: D

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4. If ω is an imaginary cube root of 1, then $\left(1+\omega-\omega^2\right)^5+\left(1-\omega+\omega^2\right)^5=$

A. 16

B. 8

C. 9

D. 32

Answer: D

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5. If $|z-3+i|=4$, then the locus of z is

A. $x^2+y^2-6x+2y-6=0$

B. x^2+y^2-60

C. $x^2+y^2-3x+y-6=0$

D. $x^2+y^2=0$

Answer: A

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6. If x satisfies $x^2-2x\cos\theta+1=0$, then the value of $x^n+\left(\frac{1}{x^n}\right)$ is

A. $2^n\cos n\theta$

B. $2^n\cos^n\theta$

C. $2\cos^n\theta$

D. $2\cos n\theta$

Answer: D

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7. The value of $\left[\frac{\left(-1+i\sqrt{3}\right)}{2}\right]^{3n}+\left[\frac{\left(-1-i\sqrt{3}\right)}{2}\right]^{3n}$ is

A. 0

B. 1

C. 2

D. 3

Answer: C

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8. If $\theta=\frac{\pi}{6}$, then the 10th term of the series $1+(\cos\theta+i\sin\theta)+(\cos\theta+i\sin\theta)^{2}+\ldots\ldots$ is

A. -1

B. $-i$

C. $\left(\frac{1+i\sqrt{3}}{2}\right)$

D. $\left(\frac{1-i\sqrt{3}}{2}\right)$

Answer: B

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9. If $4 = 5i$ is a root of the quadratic equation $x^2 + ax + b = 0$, then (a,b)=

A. $(8, 41)$

B. $(-8, 41)$

C. $(41, 8)$

D. $(-41, 8)$

Answer: B

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10. If α and β are the roots of the quadratic equation $4x^2+3x+7=0$, then the value of $\frac{1}{\alpha}+\frac{1}{\beta}=$

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

B. $\frac{-3}{7}$

C. $\frac{3}{7}$

D. $\frac{4}{7}$

Answer: B

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11. If α and β are the roots of $ax^2+bx+c=0$ and $\alpha+k, \beta+k$ are the roots of $px^2+qx+r=0$, then $\frac{b^2-4ac}{q^2-4pr}=$

A. $\frac{a}{p}$

B. 1

C. $\left(\frac{a}{p}\right)^2$

D. 0

Answer: C

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12. If $3p^2 = 5p + 2$ and $3q^2 = 5q + 2$, where $p \neq q$, then the equation whose roots are $3p - 2q$ and $3q - 2p$ is

A. $5x^2 - 3x - 100 = 0$

B. $5x^2 + 3x + 100 = 0$

C. $3x^2 + 3x + 100 = 0$

D. $3x^2 - 5x - 100 = 0$

Answer: D

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13. The value of $\left(\frac{-1+\sqrt{-3}}{2}\right)^{26}+\left(\frac{-1-\sqrt{-3}}{2}\right)^{26}$ is

A. -1

B. 1

C. 0

D. 2

Answer: A

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14. If $\left(\sqrt{3}-i\right)^{50}=2^{48}(x-iy)$, then x^2+y^2 is equal to

A. 2

B. 4

C. 8

D. 16

Answer: D

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15. The value of $\frac{i^{592}+i^{590}+i^{588}+i^{586}+i^{584}}{i^{582}+i^{580}+i^{578}+i^{576}+i^{574}}+1$ is equal to

A. 0

B. -1

C. 1

D. 2

Answer: A

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16. If $\left|\frac{z-i}{z+i}\right|=1$, then the locus of z is

A. $x = 0$

B. $y = 0$

C. $x = 1$

D. $y = 1$

Answer: B

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17. The condition that one root of the equation $ax^2 + bx + c = 0$ may be square of the other is

A. $a^2c + ac^2 + b^3 - 3abc = 0$

B. $a^2c^2 + ac^2 + b^2 + 3abc = 0$

C. $ac^2 + ac - b^3 - 3abc = 0$

D. $a^2c + ac^2 - b^3 - 3abc = 0$

Answer: A

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18. If α is one root of the equation $4x^2 + 2x - 1 = 0$, then the other root is

A. $4\alpha^3 + 3\alpha$

B. $4\alpha^3 - 3\alpha$

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

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

Answer: B

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19. If the roots of the equation $\frac{a}{x-a} + \frac{b}{x-b} = 1$ are equal in magnitude and opposite in sign, then

A. $a = b$

B. $a + b = 1$

C. $a - b = 1$

D. $a + b = 0$

Answer: D

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20. The equation of smallest degree with real coefficients having $2 + i3$ as one of the roots is

A. $x^2 + 4x + 13 = 0$

B. $x^2 + 4x - 13 = 0$

C. $x^2 - 4x + 13 = 0$

D. $x^2 - 4x - 13 = 0$

Answer: C

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21. If the expression $a(b-c)x^2+b(c-a)xy+c(a-b)y^2$ is a perfect square, then a,b,c are in

A. AP

B. HP

C. GP

D. Both AP and GP

Answer: B

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22. If $\sqrt{a+ib}$ = x + iy, then possible value of $\sqrt{a-ib}$ is

A. x^2+y^2

B. $\sqrt{x^2+y^2}$

C. $x+iy$

D. $x - iy$

Answer: D

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23. If

$(1+i)(1+2i)(1+3i)\ldots\ldots(1+ni) = a+ib, \quad \text{then} \quad 2 \times 5 \times 10 \times \ldots\ldots$

is equal to

A. $a^2 + b^2$

B. $\sqrt{a^2 + b^2}$

C. $\sqrt{a^2 - b^2}$

D. $a^2 - b^2$

Answer: A

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24. If $i^2 = -1$, then the sum $i + i^2 + i^3 + \dots\dots\dots$ to 1000 terms is equal to

A. 1

B. -1

C. $-i$

D. 0

Answer: D

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25. $\left(\dfrac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right)^n =$

A. $\cos\left(\dfrac{n\pi}{2}-n\theta\right)+i\sin\left(\dfrac{n\pi}{2}-n\theta\right)$

B. $\cos\left(\dfrac{n\pi}{2}+n\theta\right)+i\sin\left(\dfrac{n\pi}{2}+n\theta\right)$

C. $\sin\left(\dfrac{n\pi}{2}-n\theta\right)+i\cos\left(\dfrac{n\pi}{2}-n\theta\right)$

D. $\cos n\left(\dfrac{\pi}{2}+2\theta\right)+i\sin n\left(\dfrac{\pi}{2}+2\theta\right)$

Answer: A

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26. If ω is a non real cube root of unity, then $(a+b)(a+b\omega)\left(a+b\omega^2\right)=$

A. a^3+b^3

B. a^3-b^3

C. a^2+b^2

D. a^2-b^2

Answer: A

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27. If Z_1 and Z_2 are any two complex numbers, then which one of the followoing is true?

A. $|Z_1 + Z_2| = |Z_1| + |Z_2|$

B. $|Z_1 - Z_2| = |Z_1| - |Z_2|$

C. $|Z_1 + Z_2| \le |Z_1| + |Z_2|$

D. $|Z_1 - Z_2| \le |Z_1| - |Z_2|$

Answer: C

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28. If α and β are the roots of the equation $x^2 + 2x + 4 = 0$, then $\frac{1}{\alpha^3} + \frac{1}{\beta^3}$ is equal to

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

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

C. 32

D. $\frac{1}{4}$

Answer: D

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29. If $x^2 + ax + 10 = 0$ and $x^2 + bx - 10 = 0$ have a common root, then $a^2 - b^2$ is equal to

A. 10

B. 20

C. 30

D. 40

Answer: D

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30. If $2 + i$ is a root of the equation $x^3 - 5x^2 + 9x - 5 = 0$, then the other roots are

A. 1 and $2 - i$

B. $-1 \quad \text{and} \quad 3+i$

C. 0 and 1

D. $-1 \quad \text{and} \quad i-2$

Answer: A

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31. The equation of smallest degree with real co-efficients having $1+i$ as one of the roots is

A. $x^2+x+1=0$

B. $x^2-2x+2=0$

C. $x^2+2x+1=0$

D. $x^2+2x-2=0$

Answer: B

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32. The least integer k which makes the roots of the equation $x^2 + 5x + k = 0$ imaginary is

A. 4

B. 5

C. 6

D. 7

Answer: D

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33. If $x^2 px + q = 0$ is the quadratic equation whose roots are $a - 2$ and $b - 2$ where a and b are the roots of $x^2 - 3x + 1 = 0$, then

A. $p = 1, q = 5$

B. $p = 1, q = -5$

C. $p = -1, q = 1$

D. $p = 1, q = -1$

Answer: D

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34. If ω is a complex cube root of unity, then $\frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2}+\frac{c+a\omega+b\omega^2}{a+b\omega+c\omega^2}+\frac{b+c\omega+a\omega^2}{b+c\omega+a\omega^5}=$

A. 1

B. ω

C. ω^2

D. 0

Answer: D

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35. If α and β are complex cube roots of unity and $x = a\alpha + b\beta, y = a + b, z = a\beta + b\alpha$, then xyz is equal to

A. $a + b$

B. $a - b$

C. $a^2 + b^2$

D. $a^3 + b^3$

Answer: D

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36. If a,b and c are distinct positive real numbers in A.P, then the roots of the equation $ax^2 + 2bx + c = 0$ are

A. imaginary

B. rational and equal

C. rational and unequal

D. real, may be rational or irrational

Answer: D

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37. If z_1, z_2 and z_3 are any three complex numbers, then the fourth vertex of the parallelogram whose three vertices are z_1, z_2 and z_3 taken in order is

A. $z_1 - z_2 + z_3$

B. $z_1 + z_2 + z_3$

C. $\frac{1}{3}(z_1 - z_2 + z_3)$

D. $\frac{1}{3}(z_1 + z_2 - z_3)$

Answer: A

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38. Let a,b be the solutions of $x^2 + px + 1 = 0$ and c, d be the solutions of $x^2 + qx + 1 = 0$. If (a-c)(b-c) and (a+d)(b+d) are the solutions of $x^2 + ax + \beta = 0$, then β equals

A. $p + q$

B. $p - q$

C. $p^2 + q^2$

D. $p^2 - q^2$

Answer: D

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39. If α and β are the solutions of the quadratic equation $ax^2 + bx + c = 0$ such that $\beta = \alpha^{\frac{1}{3}}$, then

A. $\frac{(ac)^1}{3} + \frac{(ab)^1}{3} + c = 0$

B. $\frac{(a^3c)^1}{4} + \frac{(ab^3)^1}{4} + c = 0$

C. $\left(a^3c\right)^{\frac{1}{4}}+\left(ac^3\right)^{\frac{1}{4}}+b=0$

D. $\dfrac{\left(a^4c\right)^1}{3}+\dfrac{\left(ac^4\right)^1}{3}+b=0$

Answer: C

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40. A point P which represents a complex number Z moves such that $|Z-Z_1|=|Z-Z_2|$, then its locus is

A. a circle with centre Z_1

B. a circle with centre Z_2

C. a circle with centre Z

D. perpendicular bisector of line joining Z_1 and Z_2

Answer: D

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41. $\dfrac{(\cos\theta + i\sin\theta)^4}{(\sin\theta + i\cos\theta)^5} = ?$

A. $\cos\theta - i\sin\theta$

B. $\sin\theta - i\cos\theta$

C. $\cos 9\theta - i\sin 9\theta$

D. $\sin 9\theta - i\cos 9\theta$

Answer: D

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42. The quadratic equation whose roots are twice the roots of $2x^2 - 5x + 2 = 0$ is

A. $8x^2 - 10x + 2 = 0$

B. $x^2 - 5x + 4 = 0$

C. $2x^2 - 5x + 2 = 0$

D. $x^2 - 10x + 6 = 0$

Answer: B

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43. If $\alpha + \beta = 4$ and $\alpha^3 + \beta^3 = 44$ the α, β are the roots of the equation

A. $2x^2 - 7x + 6 = 0$

B. $3x^2 + 9x + 11 = 0$

C. $9x^2 - 27x + 20 = 0$

D. $3x^2 - 12x + 5 = 0$

Answer: D

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44. The coefficient of x in $x^2 + px + q = 0$ was taken as 17 in place of 13 and its roots were found to be -2 and -15. The roots of the original equation are

A. 3,7

B. $-3, 7$

C. $-3, \ -7$

D. $-3, \ -10$

Answer: D

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45. The value of $\left(\cos\frac{\pi}{2}+i\sin\frac{\pi}{2}\right)\left(\cos\left(\frac{\pi}{2^2}\right)+i\sin\left(\frac{\pi}{2^2}\right)\right)\left(\cos\left(\frac{\pi}{2^3}\right)+i\sin\left(\frac{\pi}{2^3}\right)\right)$ $\ldots\ldots\ldots\infty$ is

A. -1

B. 1

C. 0

D. $\sqrt{2}$

Answer: A

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46. $(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11}) = \ldots\ldots\ldots,$ where ω is the complex cube root of unity

A. 49

B. 50

C. 48

D. 47

Answer: A

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47. If $Z_r = \cos\left(\frac{\pi}{2^r}\right) + i\sin\left(\frac{\pi}{2^r}\right)$ then $Z_1 . Z_2 . Z_3 . \ldots\ldots$ upto ∞ equals

A. -3

B. -2

C. 1

D. -1

Answer: D

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48. In the Argand diagram OAP is an isosceles right angled triangle, right angled at 'O', the origin. If the point A corresponds to the complex number $\sqrt{3}+i$, then the point P corresponds to the complex number.

A. $\sqrt{3}-i \quad \text{or} \quad \sqrt{3}-i$

B. $-1+i\sqrt{3} \quad \text{or} \quad 1-i\sqrt{3}$

C. $\sqrt{3}+i \quad \text{or} \quad \sqrt{3}-i$

D. $1+\sqrt{3i} \quad \text{or} \quad 1-\sqrt{3i}$

Answer: B

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49. The real part of $\left[1+\cos\left(\frac{\pi}{5}\right)+i\sin\left(\frac{\pi}{5}\right)\right]^{-1}$

A. 1

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

C. $\frac{1}{2}\cos\left(\frac{\pi}{10}\right)$

D. $\frac{1}{2}\cos\left(\frac{\pi}{5}\right)$

Answer: B

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50. For $a \neq b$, if the equation $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, then the value of a+b=

A. -1

B. 0

C. 1

D. 2

Answer: A

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51. If $\frac{2z_1}{3z_2}$ is purely imaginary then $\left|\frac{z_1 - z_2}{z_1 + z_2}\right|$

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

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

C. $\frac{4}{9}$

D. 1

Answer: D

Watch Video Solution

52. If one of the roots of the equation $x^2 + bx + 3 = 0$ is thrice the other then, b=

A. ± 3

B. ± 2

C. 0

D. ± 4

Answer: D

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53. If α, β are the roots of the equation $(x - a)(x - b) = 5$ then the roots of the equation $(x - \alpha)(x - \beta) + 5 = 0$ are

A. $a, 5$

B. $b, 5$

C. a, α

D. a, b

Answer: D

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54. If α, β are roots of the equation $ax^2 + bx + c = 0$ then the value of $\frac{1}{a\alpha + b} + \frac{1}{a\beta + b} =$

A. $\frac{ab}{b}$

B. 1

C. $\frac{ab}{c}$

D. $\frac{b}{ac}$

Answer: D

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55. If $z = re^{i\theta}$ then $\left|e^{iz}\right| =$

A. 1

B. $e^{2r\sin\theta}$

C. $e^{r\sin\theta}$

D. $e^{-r\sin\theta}$

Answer: D

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56. $i^2 + i^4 + i^6 + \ldots\ldots\ldots\ldots \text{up to } (2k+1)$ terms, $k \in N$ is

A. 0

B. 1

C. -1

D. k

Answer: C

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57. If $z=\sqrt{2}-i\sqrt{2}$ si rotated through an angle 45° in the anti-clockwise direction about the origin, then the co-ordianates of its new position are

A. $(2, 0)$

B. $(\sqrt{2}, \sqrt{2})$

C. $(\sqrt{2}, -\sqrt{2})$

D. $(\sqrt{2}, 0)$

Answer: D

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58. If $z=\dfrac{7-i}{3-4i}$ then $z^{14}=$

A. 2^7

B. $2^7 i$

C. $2^{14} i$

D. $-2^7 i$

Answer: D

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59. If $\left(\sqrt{8}+i\right)^{50}=3^{49}(a+ib)$ then a^2+b^2 is

A. 3

B. 8

C. 9

D. 4`

Answer: A

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60. If $3p^2 = 5p + 2$ and $3q^2 = 5q + 2$, where $p \neq q$, then the equation whose roots are $3p - 2q$ and $3q - 2p$ is

A. $3x^2 - 5x - 100 = 0$

B. $5x^2 + 3x + 100 = 0$

C. $3x^2 - 5x + 100 = 0$

D. $3x^2 + 5x - 100 = 0$

Answer: A

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61. If $x = 8 + 3\sqrt{7}$ and $xy = 1$, then the value of $\frac{1}{x^2} + \frac{1}{y^2}$ is

A. 254

B. 192

C. 292

D. 66

Answer: A

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62. If α and β, α and γ and α and δ are the roots of the equations

$ax^2 + 2bx + c = 0, 2bx^2 + cx + a = 0$ and $cx^2 + ax + 2b = 0$

respectively, where a,b and c are positive real numbers, then $\alpha + \alpha^2 =$

A. -1

B. 0

C. 1

D. abc

Answer: A

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63. The solution set of the equation $pqx^2 - (p+q)^2x + (p+q)^2 = 0$ is

A. $\left\{\frac{p}{q}, \frac{q}{p}\right\}$

B. $\left\{pq, \frac{p}{q}\right\}$

C. $\left\{\frac{q}{p}, pq\right\}$

D. $\left\{\frac{p+q}{p}, \frac{p+q}{q}\right\}$

Answer: D

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64. If roots α, β of the equation $\frac{x^2 - bx}{ax - c} = \frac{\lambda - 1}{\lambda + 1}$ are such that $\alpha + \beta = 0$, then the value of λ is

A. $\frac{a-b}{a+b}$

B. c

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

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

Answer: A

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65. Let $a=e^{i\frac{2\pi}{3}}$. Then the equation whose roots are $a+a^{-2}$ and a^2+a^{-4} is

A. $x^2-2x+4=0$

B. $x^2-x+1=0$

C. $x^2+x+4=0$

D. $x^2+2x+4=0$

Answer: D

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66. If $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ are the roots of the equation $x^4 + (2 - \sqrt{3})x^2 + 2 + \sqrt{3} = 0,$ then the value of $(1 - \alpha_1)(1 - \alpha_2)(1 - \alpha_3)(1 - \alpha_4)$ is

A. 1

B. 4

C. 0

D. 5

Answer: D

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67. The roots of the eqation $(q - r)x^2 + (r - p)x + (p - q) = 0$ are

A. $\dfrac{r - p}{q - r}, 1$

B. $\dfrac{p-q}{q-r}, 1$

C. $\dfrac{p-r}{q-r}, 2$

D. $\dfrac{q-r}{p-q}, 2$

Answer: B

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68. Let ω be a imaginary root of $x^n = 1$. Then $(5-\omega)(5-\omega^2)........(5-\omega^{n-1})$ is

A. 1

B. $\dfrac{5^n+1}{4}$

C. 4^{n-1}

D. $\dfrac{5^n-1}{4}$

Answer: D

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69. 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

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

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

C. $i\sqrt{3}$

D. $-i\sqrt{3}$

Answer: C

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70. If z is a complex number such that $Re(z)=Im(z)$, then

A. $Re\left(z^2\right)=0$

B. $Img\left(z^2\right)=0$

C. $Re\left(z^2\right)=Img\left(z^2\right)$

D. $Re(z^2) = -Img(z^2)$

Answer: A

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71. If α and β are the roots of the equation $x^2 - 7x + 1 = 0$, then the value of $\frac{1}{(\alpha - 7)^2} + \frac{1}{(\beta - 7)^2}$ is

A. 45

B. 47

C. 50

D. 51

Answer: B

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72. If α and β are different complex numbers with $|\beta| = 1$, then find $\left|\dfrac{\beta - \alpha}{1 - \overline{\alpha}\beta}\right|$.

A. 0

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

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

D. 1

Answer: D

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73. If ω is a complex cube root of unity, then the value of $\sin\left\{\left(\omega^{10} + \omega^{23}\right)\pi - \dfrac{\pi}{6}\right\}$ is

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

B. $\dfrac{\sqrt{3}}{2}$

C. $-\dfrac{1}{\sqrt{2}}$

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

Answer: D

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74. Let $z = \frac{11 - 3i}{1 + i}$. If α is a real number such $z - i\alpha$ is real, then the value of α is

A. 4

B. -4

C. 7

D. -7

Answer: D

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75. Let z_1 and z_2 be the roots of the equation $z^2 + pz + q = 0$, where p,q are real. The points represented by z_1, z_2 and the origin form an equilateral triangle if

A. $p^2 = 3q$

B. $p^2 > 3q$

C. $p^2 < 3q$

D. $p^2 = 2q$

Answer: A

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76. If α, β, γ are the cube roots of a negative number p, then for any three real numbers x,y,z the value of $\frac{x\alpha + y\beta + z\gamma}{x\beta + y\gamma + z\alpha}$ is

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

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

C. $(x+y+z)i$

D. pi

Answer: B

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77. The magnitude and amplitude of $\frac{\left(1+i\sqrt{3}\right)(2+2i)}{\left(\sqrt{3}-i\right)}$ are respectively

A. $2, \frac{3\pi}{4}$

B. $4, \frac{3\pi}{4}$

C. $2\sqrt{2}, \frac{\pi}{4}$

D. $2\sqrt{2}, \frac{3\pi}{4}$

Answer: D

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

A. 0

B. 48

C. -24

D. -48

Answer: D

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79. If α and β are the roots of the equation $ax^2+bx+c=0$ then $(\alpha+\beta)^2$ is ....

A. -4

B. -1

C. 4

D. -2

Answer: D

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80. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is

A. 4

B. 12

C. 3

D. $\frac{49}{4}$

Answer: D

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81. Given tan A and tan B are the roots of $x^2 - ax + b = 0$. The value of $\sin^2(A + B)$ is

A. $\dfrac{a^2}{a^2 + (1-b)^2}$

B. $\dfrac{a^2}{a^2 + b^2}$

C. $\dfrac{a^2}{(a+b)^2}$

D. $\dfrac{b^2}{a^2 + (1-b)^2}$

Answer: A

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82. The number of roots of the equation $|x| = x^2 + x - 4$ is

A. 4

B. 3

C. 1

D. 2

Answer: A

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83. If α, β are the roots of the equation $x^2 - px + q = 0$, prove that

$$\log_e(1 + px + qx^2) = (\alpha + \beta)x - \frac{\alpha^2 + \beta^2}{2}x^2 + \frac{\alpha^3 + \beta^3}{3}x^3 - \dots$$

A. $\log(x^2 + px + q)$

B. $\log(x^2 - px + q)$

C. $\log(1 + px + qx^2)$

D. $\log(1 - px + qx^2)$

Answer: D

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84. If $\sec\alpha$ and $\operatorname{cosec}\alpha$ are the roots of the equation $x^2 - px + q = 0$, then

A. $p^2 = p + 2q$

B. $q^2 = p + 2q$

C. $p^2 = q(q+2)$

D. $q^2 = p(p+2)$

Answer: C

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85. Let $a_n = i^{(n+1)^2}$, where $i = \sqrt{-1}$ and $n = 1, 2, 3, \ldots\ldots\ldots\ldots$ Then the value of $a_1 + a_3 + a_5 + \ldots\ldots\ldots\ldots + a_{25}$ is

A. 13

B. $13 + i$

C. $13 - i$

D. 12

Answer: A

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86. If $\frac{5z_2}{11z_1}$ is purely imaginary, then the value of $\left|\frac{2z_1+3z_2}{2z_1-3z_2}\right|$ is

A. $\frac{37}{33}$

B. 2

C. 1

D. 3

Answer: C

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87. If $2\alpha = -1 - i\sqrt{3}$ and $2\beta = -1 + i\sqrt{3}$, then $5\alpha^4 + 5\beta^4 + 7\alpha^{-1}\beta^{-1}$ is equal to

A. -1

B. -2

C. 0

D. 2

Answer: D

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88. If $\dfrac{i^4+i^9+i^{16}}{2-i^8+i^{10}+i^3}=a+ib$, then (a,b) is

A. $(1, 2)$

B. $(-1, 2)$

C. $(2, 1)$

D. $(-2, -1)$

Answer: B

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89. If $\left(\sqrt{5}+\sqrt{3}i\right)^{33}=2^{49}z$, then modulus of the complex number z is equal to

A. 1

B. $\sqrt{2}$

C. $2\sqrt{2}$

D. 4

Answer: B

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90. If a is positive and if A and G are the arithmetic mean and the geometric mean of the roots $x^2 - 2ax + a^2 = 0$ respectively, then

A. A = G

B. A= 2G

C. 2A= G

D. $A^2 = G$

Answer: A

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91. Suppose that two persons A and B solve the equation $x^2 + ax + b = 0$. While solving A commits a mistake in constant term and finds the roots as 6 and 3 and B commits a mistake in the coefficient of x and finds the roots as -7 and -2. Then the equation is

A. $x^2 + 9x + 14 = 0$

B. $x^2 - 9x + 14 = 0$

C. $x^2 + 9x - 14 = 0$

D. $x^2 - 9x - 14 = 0$

Answer: B

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92. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the equation whose roots are α^{22} and β^{19}, is

A. A. $x^2 - x + 1 = 0$

B. B. $x^2 + x + 1 = 0$

C. C. $x^2 + x - 1 = 0$

D. D. $x^2 - x - 1 = 0$

Answer: B

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93. If $\sec\theta$ and $\tan\theta$ are the roots of $ax^2 + bx + c = 0 (a, b \neq 0)$, then the value of $\sec\theta - \tan\theta$ is

A. $\dfrac{-a}{b}$

B. $\dfrac{-b}{a}$

C. $\dfrac{a^2}{b^2}$

D. $1 + \dfrac{a^2}{b^2}$

Answer: A

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94. If the area of the triangle formed by the points z, z+iz and iz is 50 square units, then $|z|$ is equal to

A. 5

B. 8

C. 10

D. 12

Answer: C

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95. The locus of z such that $arg[(1-2i)z-2+5i]=\frac{\pi}{4}$ is a

A. line not passing through the origin

B. circle not possing through the origin

C. line passing through the origin

D. circle passing through the origin

Answer: A

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96. If $z = \sqrt{3} + i$, then the argument of $z^2 e^{z - i}$ is equal to

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

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

C. $e^{\frac{\pi}{6}}$

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

Answer: D

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97. If $\omega \neq 1$ and $\omega^3 = 1$, the $\frac{a\omega + b + c\omega^2}{a\omega^2 + b\omega + c} + \frac{a\omega^2 + b + c\omega}{a + b\omega + c\omega^2}$ is equal to

A. 2

B. ω

C. 2ω

D. $2\omega^2$

Answer: D

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98. The centre of a regular hexagon is at the point $z = i$. If one of its vertices is at 2+I, then the adjacent vertices of 2+I are at the points

A. A. $1 \pm 2i$

B. B. $i + 1 \pm \sqrt{3}$

C. C. $2 + i(1 \pm \sqrt{3})$

D. D. $1+i(1\pm\sqrt{3})$

Answer: D

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99. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}, (x\ne -p, x\ne -q, r\ne 0)$ are equal in magnitude but opposite in sign, then p+q is equal to

A. r

B. $2r$

C. r^2

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

Answer: B

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100. The solution of the equation $\left(3+2\sqrt{2}\right)^{x^2-8}+\left(3+2\sqrt{2}\right)^{8-x^2}=6$ are

A. $3\pm 2\sqrt{2}$

B. ± 1

C. $\pm 3\sqrt{3},\ \pm 2\sqrt{2}$

D. $\sqrt{7},\ \pm(3)$

Answer: D

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101. If $-2-i$ is a root of the equation $ax^2+12x+b=0$ (where a and b are real), then the value of ab is equal to

A. 45

B. 15

C. -15

D. -45

Answer: A

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102. If one root of the equation $lx^2 + mx + n = 0$ is $\frac{9}{2}$ (l,m and n are positive integers) and $\frac{m}{4n} = \frac{l}{m}$, then l+n is equal to

A. 80

B. 85

C. 90

D. 95

Answer: B

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103. If $x^2 + 4ax + 2 > 0$ for all values of x, then a lies in the interval

A. $(-2, 4)$

B. $(1, 2)$

C. $(-\sqrt{2}, \sqrt{2})$

D. $\left(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$

Answer: D

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

A. -20

B. -60

C. -120

D. 60

Answer: C

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105. The modulus of the complex number z such that $|z+3-i|=1$ and $arg z=\pi$ is equal to

A. 1

B. 2

C. 9

D. 3

Answer: D

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106. If $z_1, z_2, \ldots\ldots z_n$ are complex numbers such that $|z_1|=|z_2|=\ldots.=|z_n|=1$, then $|z_1+z_2+\ldots..+z_n|$ is equal to

A. $|z_1 z_2 z_3 \ldots \ldots z_n|$

B. $|z_1| + |z_2| + \ldots \ldots + |z_n|$

C. $\left|\frac{1}{z_1} + \frac{1}{z_2} + \ldots \ldots + \frac{1}{z_n}\right|$

D. n

Answer: C

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107. The value of $\frac{\cos 30^\circ + i \sin 30^\circ}{\cos 60^\circ - i \sin 60^\circ}$ is equal to

A. i

B. $-i$

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

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

Answer: A

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108. If $z = r(\cos\theta + i\sin\theta)$, then the value of $\frac{z}{\bar{z}} + \frac{\bar{z}}{z}$ is

A. $\cos 2\theta$

B. $2\cos 2\theta$

C. $2\cos\theta$

D. $2\sin\theta$

Answer: B

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109. If $z_1 = \sqrt{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$ and $z_2 = \sqrt{3}\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$, then $|z_1 z_2|$ is

A. 6

B. $\sqrt{2}$

C. $\sqrt{6}$

D. $\sqrt{3}$

Answer: C

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110. The value of a for which the equation $2x^2 + 2\sqrt{6}x + a = 0$ has equal roots, is

A. 3

B. 4

C. 2

D. $\sqrt{3}$

Answer: A

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111. If $\frac{3}{2} + \frac{7}{2}i$ is a solution of the equation $ax^2 - 6x + b = 0$, where a and b are real numbers, then the value of a+b is equal to

A. 10

B. 22

C. 30

D. 31

Answer: D

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112. If the roots of the equation $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c$ is

A. -1

B. 0

C. 1

D. 2

Answer: C

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113. If α and β are the roots of the equation $ax^2 + bx + c = 0, (c \neq 0)$, then the equation whose roots are $\frac{1}{a\alpha + b}$ and $\frac{1}{a\beta + b}$ is

A. $acx^2 - bx + 1 = 0$

B. $x^2 - acx + bc + 1 = 0$

C. $acx^2 + bx - 1 = 0$

D. $x^2 + acx - bc + 11 = 0$

Answer: A

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114. If a and b are the roots of the equation $x^2 + ax + b = 0, a \neq 0, b \neq 0,$ then the values of a and b are respectively

A. $2 \text{ and } -2$

B. $2 \text{ and } -1$

C. $1 \text{ and } -2$

D. $1 \text{ and } 2$

Answer: C

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115. If $x^2 + px + q = 0$ has the roots α and β, then the value of $(\alpha - \beta)^2$ is equal to

A. $p^2 - 4q$

B. $(p^2 - 4q)^2$

C. $p^2 + 4q$

D. $(p^2 + 4q)^2$

Answer: A

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116. The value of $i - i^2 + i^3 - i^4 + \ldots\ldots - i^{100}$ is equal to

A. i

B. $-i$

C. $1 - i$

D. 0

Answer: D

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117. If the imaginary part of $\frac{2+i}{ai-1}$ is zero, where a is a real number, then the value of a is equal to

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

B. 2

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

D. -2

Answer: C

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118. The argument of the complex number $\left(\frac{i}{2}-\frac{2}{i}\right)$ is equal to

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

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

C. $\frac{\pi}{12}$

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

Answer: D

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119. Let $z_1 = 3 + 4i$ and $z_2 = -1 + 2i$. Then $|z_1 + z_2|^2 - 2\left(|z_1|^2 + |z_2|^2\right)$ is equal to

A. $|z_1 - z_2|^2$

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

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

D. $|z_1|^2 - |z_2|^2$

Answer: B

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120. If z_1 and z_2 are two non-zero complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$, then $arg\left(\frac{z_1}{z_2}\right)$ is equal to

A. 0

B. $-\pi$

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

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

Answer: A

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121. If the equation $x^2 - (2+m)x + (m^2 - 4m + 4) = 0$ in x has equal roots, then the values of m are

A. $\frac{2}{3}, 1$

B. $\frac{2}{3}, 6$

C. $0, 1$

D. $0, 2$

Answer: B

Watch Video Solution

122. The number of integral values of b, for which the equation $x^2 + bx - 16 = 0$ has integral roots, is

A. 2

B. 3

C. 4

D. 5

Answer: D

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123. If $(1+i)$ is a root of the equation $x^2 - x + (1-i) = 0$, then the other root is

A. $1 - i$

B. i

C. $-i$

D. $2i$

Answer: C

Watch Video Solution

124. If the roots of the quadratic equation $3x^2 + 2x + a^2 - a = 0$ in x are of opposite signs, then a lies in the interval

A. $(-\infty, -2)$

B. $(-\infty, 0)$

C. $(-1, 0)$

D. $(0, 1)$

Answer: D

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125. The number of real roots of the equation $|x|^2 - 3|x| + 2 = 0$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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126. Let a,b, c be positive real numbers. If $\frac{x^2 - bx}{ax - c} = \frac{m-1}{m+1}$ has two roots which are numerically equal but opposite in sign, then the value of m is

A. c

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

C. $\frac{a+b}{a-b}$

D. $\frac{a-b}{a+b}$

Answer: D

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127. The equation $k \sin x + \cos 2x = 2k - 7$ has a solution if

A. $k > 6$

B. $2 \leq k \leq 6$

C. $k < 2$

D. $-6 \leq k \leq -2$

Answer: B

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128. If $z_k = e^{i\theta_k}$ for k= 1, 2, 3, 4 where $i^2 = -1$, and if $\left|\sum_{k=1}^{4} \frac{1}{z_k}\right| = 1$, then $\left|\sum_{k=1}^{4}\right|$ is equal to

A. 4

B. 1

C. 2

D. 3

Answer: B

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129. If $z = \frac{-1}{2} + i\frac{\sqrt{3}}{2}$, then $8 + 10z + 7z^2$ is equal to

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

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

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

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

Answer: C

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130. Let $z \neq 1$ be a complex number and let $omeg = x + iy, y \neq 0$. If $\frac{\omega - \overline{\omega}z}{1 - z}$ is purely real, then $|z|$ is equal to

A. $|\omega|$

B. $|\omega|^2$

C. $\frac{1}{|\omega|^2}$

D. 1

Answer: D

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131. The locus of z such that $\left|\frac{1+iz}{z+i}\right|=1$ is

A. $y-x=0$

B. $y+x=0$

C. $y=0$

D. $xy=1$

Answer: C

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132. The value of $\sum_{k=0}^{n}\left(i^k+i^{k+1}\right)$, where $i^2=-1$, is equal to

A. $i - i^n$

B. $-i + i^{n+1}$

C. $i - i^{n+1}$

D. $i - i^{n+2}$

Answer: D

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133. Let $z_1 = \dfrac{2\sqrt{3} + i6\sqrt{7}}{6\sqrt{7} + i2\sqrt{3}}$ and $z_2 = \dfrac{\sqrt{11} + i3\sqrt{13}}{3\sqrt{13} - i\sqrt{11}}$. Then $\left|\dfrac{1}{z_1} + \dfrac{1}{z_2}\right|$ is equal to

A. 47

B. 264

C. $|z_1 - z_2|$

D. $|z_1 + z_2|$

Answer: D

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134. If the equation $ax^2 + bx + c = 0, a > 0$, has two distinct real roots α and β such that $\alpha < -5$ and $\beta > 5$, then

A. $c > 0$

B. $c = 0$

C. $c = \frac{a+b}{2}$

D. $c < 0$

Answer: D

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135. If α and β are the distinct roots of $ax^2 + bx + c = 0$, where a,b and c are non-zero real numbers, then $\frac{a\alpha^2 + b\alpha + 6c}{a\beta^2 + b\beta + 9c} + \frac{a\beta^2 + b\beta + 19c}{a\alpha^2 + b\alpha + 13c}$ is equal to

A. $18c$

B. $27c$

C. $(36)(27)$

D. $\frac{17}{8}$

Answer: D

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136. If the equations $x^2 + ax + bc = 0$ and $x^2 + bx + ca = 0$ have a common root and if a, b and c are non-zero distinct real numbers, then their other roots satisfy the equation

A. $x^2 + x + abc = 0$

B. $x^2 - (a + b)x + ab = 0$

C. $x^2 + (a + b)x + ab = 0$

D. $x^2 + x + ab = 0$

Answer: B

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137. If $y = x + \frac{1}{x}, x \neq 0,$ then the equation $\left(x^2 - 3x + 1\right)\left(x^2 - 5x + 1\right) = 6x$ reduces to

A. $y^2 - 8y + 7 = 0$

B. $y^2 + 8y + 7 = 0$

C. $y^2 - 8y - 9 = 0$

D. $y^2 - 8y + 9 = 0$

Answer: D

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138. Let x_1 and y_1 be real numbers. If z_1 and z_2 are complex numbers such that $|z_1| = |z_2| = 4$, then $|x_1 z_1 - y_1 z_2|^2 + |y_1 z_1 + x_1 z_2|^2 =$

A. $32(x_1^2 + y_1^2)$

B. $16(x_1^2 + y_1^2)$

C. $4(x_1^2 + y_1^2)$

D. 32

Answer: A

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139. Let z_1 and z_2 be complex numbers such that $z_1 + i(\overline{z_2}) = 0$ and $arg(\overline{z_1} z_2) = \frac{\pi}{3}$. Then $arg(\overline{z_1})$ is

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

B. π

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

D. $\frac{5\pi}{12}$

Answer: D

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140. If z is a complex number such that $z+|z|=8+12i$, then the value of $|z^2|$ is equal to

A. 228

B. 144

C. 121

D. 169

Answer: D

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141. The value of $\frac{1}{i}+\frac{1}{i^2}+\frac{1}{i^3}+......+\frac{1}{i^{102}}$ is equal to

A. $-1-i$

B. $-1+i$

C. $1+i$

D. $1-2i$

Answer: A

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142. Let the complex numbers z_1, z_2, z_3 and z_4 denote the vertices of a square taken in order. If $z_1 = 3+4i$ and $z_3 = 5+6i$, then the other two vertices z_2 and z_4 are respectively

A. $5+4i, 5+6i$

B. $5+4i, 3+6i$

C. $5+6i, 3+5i$

D. $3+6i, 5+3i$

Answer: B

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143. The quadratic equation $(x-a)(x-b)+(x-b)(x-c)+(x-c)(x-a)=0$ has equal roots if

A. $a \neq b, b = c$

B. $a = b, b \neq c$

C. $a \neq b, b \neq c$

D. $a = b, b = c$

Answer: D

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144. Let α and β be the roots of the equation $px^2+qx+r=0$. If p,q, r in A.P. and $\alpha+\beta=4$, then $\alpha\beta$ is equal to

A. -9

B. 9

C. -5

D. 5

Answer: A

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145. If the roots of the equation $x^2+px+c=0$ are 2,-2 and the roots of the equation $x^2+bx+q=0$ are -1,-2, then the roots of the equation $x^2+bx+c=0$ are

A. $-3, \ -2$

B. $-3, 2$

C. $1, \ -4$

D. $-5, 1$

Answer: C

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146. If a is a root of the equation $x^2 - 3x + 1 = 0$, then the value of $\frac{a^3}{a^6 + 1}$ is equal to

A. $\frac{1}{14}$

B. $\frac{1}{15}$

C. $\frac{1}{16}$

D. $\frac{1}{18}$

Answer: D

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147. If the sum of the roots of the equation $(a+1)x^2 + (2a+3)x + (3a+4) = 0$, is -1.Find its product.

A. 4

B. 2

C. 1

D. -2

Answer: B

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148. The product of the roots of the equation $x|x| - 5x - 6 = 0$ is equal to

A. 36

B. -36

C. -18

D. 6

Answer: B

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

A. 8

B. 2

C. 5

D. 4

Answer: B

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150. Let $w \neq \pm 1$ be a complex number. If $|w| = 1$ and $z = \frac{w-1}{w+1}$, then Re(z) is equal to

A. 1

B. $\frac{1}{|w+1|}$

C. $Re(w)$

D. 0

Answer: D

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151. If $z = e^{\frac{2\pi i}{3}}$, then $1 + z + 3z^2 + 2z^3 + 2z^4 + 3z^5$ is equal to

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

B. $3e^{\frac{\pi i}{3}}$

C. $3e^{\frac{2\pi i}{3}}$

D. $-3e^{\frac{2\pi i}{3}}$

Answer: A

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152. If $z_1 = 2\sqrt{2}(1+i)$ and $z_2 = 1 + i\sqrt{3}$, then $z_1^2 z_2^3$ is equal to

A. $128i$

B. $64i$

C. $-64i$

D. $-128i$

Answer: D

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153. If the complex numbers z_1, z_2 and z_3 denote the vertices of an isoceles triangle, right angled at z_1, then $(z_1 - z_2)^2 + (z_1 - z_3)^2$ is equal to

A. 0

B. $(z_2 + z_3)^2$

C. 2

D. $(z_2 - z_3)^2$

Answer: D

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154. If the roots of $x^2 - ax + b = 0$ are two consecutive odd integers, then $a^2 - 4b$ is

A. 3

B. 4

C. 5

D. 6

Answer: B

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155. If α and β are the roots of $x^2 - ax + b^2 = 0$, then $\alpha^2 + \beta^2$ is equal to

A. $a^2 + 2b^2$

B. $a^2 - 2b^2$

C. $a^2 - 2b$

D. $a^2 + 2b$

Answer: B

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156. If α and β are the roots of the equation $x^2 + 3x - 4 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to

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

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

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

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

Answer: B

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157. The value of x such that $3^{2x} - 2(3^{x+2}) + 81 = 0$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

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158. If the roots of the equation $x^2 + 2bx + c = 0$ are α and β, then $b^2 - c =$

A. $\frac{(\alpha - \beta)^2}{4}$

B. $(\alpha + \beta)^2 - \alpha\beta$

C. $(\alpha + \beta)^2 + \alpha\beta$

D. $\frac{(\alpha + \beta)^2}{4} - \alpha\beta$

Answer: A

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159. The equation whose roots are the squares of the roots of the eqation $2x^2 + 3x + 1 = 0$ is

A. $4x^2 + 5x + 1 = 0$

B. $4x^2 - x + 1 = 0$

C. $4x^2 - 5x - 1 = 0$

D. $4x^2 - 5x + 1 = 0$

Answer: D

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160. z and ω are two nonzero complex number such that $|z| = |\omega|$ and $Arg z + Arg \omega = \pi$ then z equals

A. $\overline{\omega}$

B. $-\overline{\omega}$

C. π

D. $-\omega$

Answer: B

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161. If $|z-4|<|z-2|$, its solution is given by

A. $Re(z)>0$

B. $Re(z)<0$

C. $Re(z)>3$

D. $Re(z)>2$

Answer: C

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162. The locus of the centre of a circle which touches the circle $|z-z_1|=a$ and $|z-z_2|=b$ externally $(z, z_1$ and z_2 are complex numbers) will be

A. an ellipse

B. a hyperbola

C. a circle

D. None of these

Answer: B

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163. If $\alpha \neq \beta$ but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$ then the equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is

A. $3x^2 - 25x + 3 = 0$

B. $x^2 + 5x - 3 = 0$

C. $x^2 - 5x + 3 = 0$

D. $3x^2 - 19x + 3 = 0$

Answer: D

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164. Difference between the corresponding roots of $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ is same and $a \neq b$, then

A. $a + b + 4 = 0$

B. $a + b - 4 = 0$

C. $a - b - 4 = 0$

D. $a - b + 4 = 0$

Answer: A

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165. Product of real roots of the equation $x^2 + |x| + 9 = 0$

A. is always positive

B. is always negative

C. does not exist

D. None of these

Answer: C

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166. If p and q are the roots of the equation $x^2 + px + q = 0$, then

A. $p = 1, q = -2$

B. $p = 0, q = 1$

C. $p = -2, q = 0$

D. $p = -2, q = 1$

Answer: A

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167. If a,b , c are distinct +ve real numbers and $a^2 + b^2 + c^2 = 1$ then $ab + bc + ca$ is

A. less than 1

B. equal to 1

C. greater than 1

D. any real number

Answer: A

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168. The value of a for which one root of the quadratic equation $(a^2 - 5a + 3)x^2 + (3a - 1)x + 2 = 0$ is twice as large as the other is

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

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

C. $-\frac{1}{3}$

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

Answer: D

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169. If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then $\frac{a}{c}, \frac{b}{a}$ and $\frac{c}{b}$ are in

A. geometric progression

B. harmonic progression

C. arithmetic- geometric progression

D. arithmetic progression

Answer: B

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170. The number of real solution of the equation $x^2 - 3|x| + 2 = 0$ is

A. 4

B. 1

C. 3

D. 2

Answer: A

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

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

A. -1

B. i

C. $-i$

D. 1

Answer: C

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173. Let z_1 and z_2 be two roots of the equation $z^2 + az + b = 0$, z being complex number further, 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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174. Let two numbers have arithmetic mean 9 and geometric mean 4. Then these numbers are the roots of the quadratic equation

A. $x^2 + 18x - 16 = 0$

B. $x^2 - 18x + 16 = 0$

C. $x^2 + 18x + 16 = 0$

D. $x^2 - 18x - 16 = 0$

Answer: B

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175. If $(1-p)$ is a root of quadratic equation $x^2+px+(1-p)=0$ then its roots are

A. $0, \ -1$

B. $-1, 1$

C. $0, 1$

D. $-1, 2$

Answer: A

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176. If one root of the equation $x^2+px+12=0$ is 4, while the equation $x^2+px+q=0$ has equal roots, then the value of q is

A. 3

B. 12

C. $\frac{49}{4}$

D. 4

Answer: C

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177. Let z, ω be complex numbers such that $\bar{z} + i\overline{\omega} = 0$ and $arg z\omega = \pi$

. Then arg z equals

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

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

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

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

Answer: A

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178. If $z = x - iy$ and $z^{\frac{1}{3}} = p + iq$, then $\frac{\left(\frac{x}{p} + \frac{y}{q}\right)}{(p^2 + q^2)}$ is equal to

A. 2

B. -1

C. 1

D. -2

Answer: D

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

A. a circle

B. the imaginary axis

C. the real axis

D. an ellipse

Answer: B

Watch Video Solution

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

D. 0

Answer: D

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181. If $\omega = \frac{z}{z - \left(\frac{1}{3}\right)i}$ and $|\omega| = 1$, then z lies on

A. a circle

B. an ellipse

C. a parabola

D. a straight line

Answer: D

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182. If the cube roots 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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183. The value of a for which the sum of the squares of the roots of the equation $x^2 - (a-2)x - a - 1 = 0$ assume the least value is

A. 0

B. 1

C. 2

D. 3

Answer: B

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184. If the both roots of the equation $x^2 - bx + c = 0$ be two consecutive integers, then $b^2 - 4c$ equals

A. 3

B. -2

C. 1

D. 2

Answer: C

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185. If the both the roots of the quadratic equation $x^2 - 2kx + k^2 + k - 5 = 0$ are less than 5, then k

A. $(6, \infty)$

B. $(5, 6)$

C. $(4, 5)$

D. $(-\infty, 4)$

Answer: D

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186. Find the derivative of $x^n + ax^{n-1} + a^2x^{n-1} + \ldots + a^{n-1}x + a^n$ for some fixed real number a.

A. smaller then α

B. greater then α

C. equal to α

D. greater than or equal to α

Answer: A

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187. If the roots of the quadratic equation $x^2 + px + q = 0$ are $\tan 30^\circ$ and $\tan 15^\circ$, respectively then the value of $2 + q - p$ is

A. 2

B. 3

C. 0

D. 1

Answer: B

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188. All the values of m for which both roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than -2 but less than 4, lie in the interval

A. $-2 < m < 0$

B. $m > 3$

C. $-1 < m < 3$

D. $1 < m < 4$

Answer: C

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189. The value of is $\sum_{k=1}^{10}\left(\sin\frac{2k\pi}{11}+i\cos\frac{2k\pi}{11}\right)$ is

A. i

B. 1

C. -1

D. $-i$

Answer: D

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

A. 18

B. 54

C. 6

D. 12

Answer: D

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191. If, $|z+4| \leq 3$, then the maximum value of $|z+1|$ is

A. 6

B. 0

C. 4

D. 10

Answer: A

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192. If the difference between the roots of the equation $x^2 + ax + 1 = 0$ is less then $\sqrt{5}$, then the set of possible values of a is

A. $(3, \infty)$

B. $(-\infty, -3)$

C. $(-3, 3)$

D. $(-3, \infty)$

Answer: C

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193. The quadratic equations $x^2 - 6x + a = 0$ and $x^2 - cx + 6 = 0$ have one root in common. The other roots of the first and second equations are integers in the ratio 4 : 3. Then the common root is

A. 2

B. 1

C. 4

D. 3

Answer: A

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