MATHS

BOOKS - PATHFINDER MATHS (BENGALI ENGLISH)

COMPLEX NUMBER

Question Bank

1. The amplitude of the complex no. $z = 1$ is

A. a) π

B. b) 0

C. c) $-\pi$

D. d) undefined

Answer: D

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2. If ω be the imaginary cube root of unity then the value of ω^{241} will be

A. 0

B. 1

C. ω

D. ω^2

Answer: C

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3. If $i=\sqrt{-1}$ then the value of $1+i+i^2+i^3+i^4$ will be

A. 0

B. 1

C. (-1)

D. 2

Answer: B

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4. The modulus of complex no. (1+i)/(1-i) is

A. 0

B. 1

C. 2

D. none of these

Answer: B

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5. The square root of 2i is

A. $\pm(1+i)$

B. $\pm(1-i)$

C. $\pm i$

D. none of these

Answer: A

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6. $z+\bar{z}=0$ if and only if

A. Im(z)=0

B. Re(z)=0

C. BothRe(z)=0 and im(z)=0

D. none of these

Answer: B

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7. $z = i^5$ then the value of $(z + z^2 + z^3 + z^4)$

A. 1

B. (-i)

C. 0

D. (-1)

Answer: C

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8. Find the principal amplitude of (-1-i).

A. $\left(\frac{\pi}{4}\right)$

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

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

D. none of these

Answer: B

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9. If $|x+3|=5$ then the value of x is

A. `(+-4)

B. (± 5)

C. (± 3)

D. none of these

Answer: A

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10. If z=3i then the value of $z\bar{z}$ is

A. 81

B. 27

C. 9

D. (-9)

Answer: C

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11. If $(x+iy)(1+i)=2$ then

A. $x=1$, $y=2$

B. $x=1, y=0$

C. $x=2$, $y=1$

D. $x=1$, $y=(-1)$

Answer: D

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12. In argand plane the complex no. $\left(\frac{1+2i}{1+i}\right)$ lies in

A. ist quadrant

B. 2nd quadrant

C. 3rd quadrant

D. 4th quadrant

Answer: B

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13. If the complex nos (sinx+icos2x)and (cosx-isin2x) are conjugate to each other then the value of x is

A. 0

B. $\left(\frac{\pi}{2}\right)$

C. π

D. none of these

Answer: D

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14. If $iz^3 + z^2 - z + i = 0$ then the value of $|z|$ is

A. 2

B. 1

C. $\sqrt{2}$

D. none of these

Answer: B

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15. The value of $\left(\frac{1+\sqrt{-3}}{2}\right)^6 + \left(\frac{1-\sqrt{-3}}{2}\right)^9$ is

A. 0

B. 1

C. 2

D. 3

Answer: A

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16. The number of complex no z such that $|z-1|=|z-3|=|z-i|$ is

A. a) 0

B. b) 3

C. c) 2

D. 4) none of these

Answer: C

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17. The complex no z=x+iy satisfying the condition $amp\left(\frac{z-i}{z+i}\right)=\frac{\pi}{4}$ lies on

A. a st. line

B. a circle

C. an ellipse

D. a hyperbola

Answer: B

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18. If z_1 and z_2 are two complex no. st $|z_1+z_2|$ =$|z_1|+|z_2|$ then

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

B. $arg(z_1)+arg(z_2)=0$

C. $arg(z_1z_2)=0$

D. none of these

Answer: A

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19. Let z_1 and z_2 are two complex nos s.t. $|z_1| = |z_2| = 1$ then $\left|\frac{z_1 - z_2}{1 - z_1 \bar{z}_2}\right|$ is equal to

A. a. 2

B. b. 1/2

C. c. 1

D. d. none of these

Answer: D

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20. The product of all the values of $(1 + i\sqrt{3})^{\frac{3}{4}}$ is equal to

A. 80

B. (-8i)

C. (-8)

D. 8

Answer: C

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21. The value of $(1 - i)^{-2} - (1 + i)^{-2}$ is

A. (-i)

B. 1

C. i

D. none of these

Answer: C

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22. If p,q,r three complex nos. so that p+q+r =0 and $|p| = |q| = |r| = 1$ then the value of $\left(\frac{1}{p} + \frac{1}{q} + \frac{1}{r}\right)$ is

A. 3

B. 1

C. 0

D. none of these

Answer: C

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23. The modulus of $(x - iy)^2$ is

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

B. (x^2+y^2)

C. (x^2+4y^2)

D. $(4x^2+y^2)$

Answer: B

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24. If $2i^2+6i^3+3i^{16}-6i^{19}+4i^{25}=x+iy$, then

A. a) x=4 ,y=-1

B. b) x=1 , y=-4

C. c) x=-1, y=-4

D. d) x=1,y=4

Answer: D

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25. The value of $\left(\cos\left(\frac{\pi}{10}\right)+i\sin\left(\frac{\pi}{10}\right)\right)\left(\cos\left(\frac{2\pi}{10}\right)+i\sin\left(\frac{2\pi}{10}\right)\right)\left(\cos\left(\frac{3\pi}{10}\right)+i\sin\left(\right.\right.$

is

A. a) (-1)

B. b) 1

C. c) 2

D. d) (-2)

Answer: A

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26. If $\frac{(a+i)^2}{2a-1}=p+iq$ then find the values of $\left(p^2+q^2\right)$

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27. If ω and ω^2 be the imaginary cube roots of unity then find the value of

$(3+3\omega+5\omega^2)^6-(2+6\omega+2\omega^2)^3$

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28. Value of $i^n+i^{n+1}+i^{n+2}+i^{n+3}(\text{when} i=\sqrt{-1})-$

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29. If (1+i)(2+i)(3+i).........(n+i)=a+ib then show that $2.5.10.\dots\dots\dots(n^2+1)=a^2+b^2$

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30. Find the least possible integral value of n so that `((1+i)/(1-i))^n' is real

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31. Find the amplitude of $\left(\sqrt{3}+i\right)$

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32. Find the value of $\sqrt{\left[-3+\sqrt{\left(\left\{-3+\sqrt{-3+\ldots\text{to infinity}}\right\}\right)}\right]}$

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33. Express $\dfrac{1}{(1-i)^3}$ in the form A+iB

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34. Find the square root of (i)

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35. Show that $x^3-1=(x-1)(x-\omega)\left(x-\omega^2\right)$

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36. Find 4th roots of 1

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37. Express each of the following expressions as the sum of two squares:

$(1+x^2)(1+y^2)(1+z^2)$

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38. If $|z| > 1$ then find the position of the complex no. of z in argand plane.

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39. If $|z+2| + |z-2| \leq 6$ then find the maximum value of $|z|$

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40. If $z^2 + |z|^2 = 0$ then find the imaginary value of z

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41. Show that in argand plane the complex number (1+4i),(2+7i)and (3+10i) are collinear.

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42. z_1 and z_2 are two different complex nos where $z_1 \neq 0$ $z_2 \neq 0$ prove that $(|z_1| + |z_2|)\left|\frac{z_1}{|z_1|} + \frac{z_2}{|z_2|}\right| \leq 2(|z_1| + |z_2|)$

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43. If x=a+b ,$y = a\omega + b\omega^2$, $z = a\omega^2 + b\omega$ then show that , $x^3 + y^3 + z^3 = 3(a^3 + b^3)$

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44. Find the modulus and amplitude of the complex nos $\dfrac{1+\cos\alpha+i\sin\alpha}{1+\cos\alpha-i\sin\alpha}$

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45. Express the complex nos $\dfrac{1+7i}{(2-i)^2}$ in polar form

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46. Factorise $a^3+b^3+c^3-3abc$

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47. Find the square roots : $x-i\sqrt{x^4+x^2+1}$

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48. If ω is the imaginary cube root of 1 then prove that $\left(a+b\omega+c\omega^2\right)^3+\left(a+b\omega^2+c\omega\right)^3$=

$(2a-b-c)(2b-a-c)(2c-a-b)$

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49. If $y=\sqrt{x^2+6x+8}$ then show that one of the value of $\sqrt{1+iy}+\sqrt{1-iy}$ is $\sqrt{2x+8}\ \left(i=\sqrt{-1}\right)$

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50. If $x=\cos\alpha+i\sin\alpha$ and $1+\sqrt{1-y^2}=ny$ then show that $\frac{y}{2}n(1+nx)\left(1+\frac{n}{x}\right)=1+$ ycosalpha`

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51. If $a = \frac{1}{2}(5 - i\sqrt{3})$ then find the value of $a^3 - 6a^2 + 12a - 8$

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52. Show that complex numbers $(2 + i3), (2 - i3), (3 - i2), (3 + i2)$ are concyclic in the argand plane

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53. If in argand plane the vertices A,B,C of an isoceles triangle are represented by the complex nos z_1, z_2, z_3 respectively where $\angle C = 90^\circ$ then show that $(z_1 - z_2)^2 = 2(z_1 - z_3)(z_3 - z_2)$

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54. If z_1, z_2, z_3 are three complex number then prove that $z_1 Im(\bar{z}_2 . z_3) + z_2 Im(\bar{z}_3 . z_1) + z_3 Im(\bar{z}_1 . z_2) = 0$

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55. Prove that $\left(1-\omega^2\right)\left(1-\omega^2+\omega^4\right)\left(1-\omega^4+\omega^8\right)$.......... to 2n terms $=2^{2n}$

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56. If $x-iy=\sqrt{\dfrac{a+ib}{c-id}}$, prove that $\left(x^2+y^2\right)^2=\dfrac{a^2+b^2}{c^2+d^2}$

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57. If z be complex no. and $\dfrac{z-1}{z+1}$ be purely imaginary show that z lies on the circle whose centre is at origin and the radius is 1

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58. z_1 and z_2 be two complex no. then prove that $|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2\left[|z_1|^2 + |z_2|^2\right]$

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59. If $z = \dfrac{3}{2 + \cos\theta + i\sin\theta}$ then show that z lies on a circle in the complex plane

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60. If $a = \cos\alpha + i\sin\alpha, b = \cos\beta + i\sin\beta, c = \cos\gamma + i\sin\gamma$ and $\frac{b}{c} + \frac{c}{a} + \frac{a}{b} = 1$, then $\cos(\beta - \gamma) + \cos(\gamma - \alpha) + \cos(\alpha - \beta)$=

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

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

C. c) 0

D. d) 1

Answer:

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61. If ω is the imaginary cube root of unity and a+b+c=0 then show that $\left(a+b\omega+c\omega^2\right)^3+\left(a+b\omega^2+c\omega\right)^3=27abc$

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62. If z_1, z_2, z_3 represent three vertices of an equilateral triangle in argand plane then show that $\dfrac{1}{z_1-z_2}+\dfrac{1}{z_2-z_3}+\dfrac{1}{z_3-z_1}=0$

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63. Prove that the complex numbers z_1, z_2 and the origin from an isoceles triangle with vertical angle $\dfrac{2\pi}{3}$ if $z_1^2+z_1z_2+z_2^2=0$

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64. If $(1+x)^n = a_0 + a_1x + a_2x^2 + \ldots\ldots + a_nx^n$ then show that $(a_0 - a_2 + a_4 - \ldots\ldots)^2 + (a_1 - a_3 + a_5 - \ldots\ldots)^2 = a_0 + a_1 + a_2 + \ldots$

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65. If $z_1, z_2, z_3 \ldots\ldots\ldots\ldots z_n$ are n complex numbers s.t, $|z_1| = |z_2| = \ldots\ldots\ldots\ldots |z_n| = 1$ then show that $|z_1 + z_2 + \ldots\ldots + z_n| = \left|\left(\frac{1}{z_1}\right) + \left(\frac{1}{z_2}\right) + \ldots\ldots + \left(\frac{1}{z_n}\right)\right|$

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66. z_1 and z_2 be two complex no. then prove that $|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2\left[|z_1|^2 + |z_2|^2\right]$

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67. If $\cos\theta = \frac{1}{2}\left(a + \frac{1}{a}\right)$ $\cos(\phi) = \frac{1}{2}\left(b + \frac{1}{b}\right)$ show that one of the values of $2\cos(\theta - \phi)$is $\left(\frac{a}{b} + \frac{b}{a}\right)$

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68. If $x = -5 + 2\sqrt{-4}$, find the value of $x^2 + 4$.

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69. Find the sum and product of the two complex numbers $z_1 = 2 + 3i$ and$z = -1 + 5i$.

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70. Express $\frac{1}{1 - \cos\theta + i\sin\theta}$ in the form a+ib

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71. Find argument of :

$1+\sqrt{2}i$

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72. Find argument of :

$-1+\sqrt{3}i$

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73. Find argument of :

$-1-\sqrt{3}i$

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74. Find argument of :

$1-\sqrt{3}i$

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75. If $|z+3| \leq 4$, then the max. value of $|z|$ is

A. 3

B. 5

C. 6

D. 7

Answer: D

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76. If z=x-iy and $z^{\frac{1}{3}} = p + iq$ then $\dfrac{\frac{x}{p} + \frac{y}{q}}{p^2 + q^2}$ is equal to

A. 1

B. (-1)

C. 2

D. (-2)

Answer: D

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77. Represent the given complex numbers in polar form :

$i(1 - i\sqrt{3}) = i - i^2\sqrt{3} = \sqrt{3} + i$

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78. Represent the given complex numbers in polar form :

$\sin\alpha - i\cos\alpha(\alpha acute)$

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79. If z_1 andz_2 be two complex numbers such that $\left|\dfrac{z_1 - 2z_2}{2 - z_1\bar{z}_2}\right| = 1$ and $|z_2| \neq 1$, what is the value of $|z_1|$?

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80. If in argand plane the vertices A,B,C of an isoceles triangle are represented by the complex nos z_1, z_2, z_3 respectively where $\angle C = 90^\circ$ then show that $(z_1 - z_2)^2 = 2(z_1 - z_3)(z_3 - z_2)$

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81. Find the square root of -7-24i

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82. If $x_r = \cos\left(\frac{\pi}{3^r}\right) + i\sin\left(\frac{\pi}{3^r}\right)$: prove that $x_1x_2x_3$....upto infinity=i

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83. if α, β, γ are roots of $x^3 - 3x^2 + 3x + 7 = 0,$ then find $\frac{\alpha - 1}{\beta - 1} + \frac{\beta - 1}{\gamma - 1} + \frac{\gamma - 1}{\alpha - 1}$

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84. If $\alpha_1, \alpha_2 .... \alpha_{n-1}$ are the nth roots of unity then show that $(5 - \alpha_1)(5 - \alpha_2)(5 - \alpha_3)...(5 - \alpha_{n-1}) = \frac{5^n - 1}{4}$

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85. Show that the points represented by complex numbers (3+2i),(2-i),-7i are collinear.

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86. Find the centre and radius of circle $2|z|^2 + (3 - i)z + (3 + i)\bar{z} - 7 = 0$

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87. Find all the circles which are orthogonal to $|z| = 1$ and $|z - 1| = 4$

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88. If z_1, z_2, z_3 are complex numbers such that $\frac{2}{z_1} = \frac{1}{z_2} + \frac{1}{z_3}$, show that the points represented by z_1, z_2, z_3 lie on a circle passing through the origin.

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89. If 4x+i(3x-y)=3+i(-6), where x and y are real numbers, then find the values of x and y.

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90. Find the multiplicative inverse of 2-3i.

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91. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form.

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92. Find real θ such that $\frac{3+2i\sin\theta}{1-2i\sin\theta}$ is purely real.

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93. Convert the complex number $z=\frac{i-1}{\cos\left(\frac{\pi}{3}\right)+i\sin\left(\frac{\pi}{3}\right)}$ in the polar form.

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94. $\left\{1+(-i)^{4n+3}\right\}(1-i), (n \in N)$ equals

A. 2

B. (-2)

C. 1

D. i

Answer: A

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

A. 0

B. π

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

D. None if these

Answer: A

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96. If $z = (1+i)\dfrac{\left(1+\sqrt{3}i\right)^2}{1-i}$, then argz equal

A. 2π

B. 4π

C. $2\pi + \dfrac{\pi}{6}$

D. $4\pi + \dfrac{\pi}{6}$

Answer: D

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97. The equation $z^3 = \bar{z}$ has

A. no solution

B. two solution

C. four solution

D. an infinite number of solution

Answer: C

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98. In the argand plane ABCD is a square described in the anticlockwise sense. A and B represented by complex numbers 1+2i and 7-6i respectively. Then vertices C and D of the square are.

A. (7-4i), (1+12i)

B. (7+4i), (1-12i)

C. (7-4i), (1+12i)

D. (7-4i), (1-12i)

Answer: A

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99. $(-64)^{\frac{1}{4}}$ equals

A. $\pm 2(1+i)$

B. $\pm 2(1-i)$

C. $\pm 2(1 \pm i)$

D. None if these

Answer: C

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100. If ω is an imaginary cube root of unity then the value of $\omega^n + \omega^{2n}$ (where n is not a multiple of 3) is

A. 0

B. $-\omega$

C. ω^2

D. (-1)

Answer: D

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101. Solve: $z^7 - 1 = 0$

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102. Located the complex numbers z=x+iy for which: $\log_{\frac{1}{2}}\left(\frac{|z-1|+4}{3|z-1|-2}\right) > 1$

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103. If z_1, z_2, z_3 represent three vertices of an equilateral triangle in argand plane then show that $\frac{1}{z_1 - z_2} + \frac{1}{z_2 - z_3} + \frac{1}{z_3 - z_1} = 0$

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104. Express the following expreeion in the form of a+ib :

$$\frac{\left(3+i\sqrt{5}\right)\left(3-i\sqrt{5}\right)}{\left(\sqrt{3}+\sqrt{2}i\right)-\left(\sqrt{3}-i\sqrt{2}\right)}$$

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

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

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

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108. If (a+ib)(c+id)(e+if)(g+ih)=A+iB, then show that $(a^2 + b^2)(c^2 + d^2)(e^2 + f^2)(g^2 + h^2) = A^2 + B^2$

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109. If $iz^3 + z^2 - z + i = 0$ then the value of $|z|$ is

A. 4

B. 3

C. 2

D. 1

Answer: D

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110. If $z_1 \neq z_2$ and $|z_2| = 1$ the $\left|\frac{z_1 - z_2}{1 - \bar{z}_1 z_2}\right|$=

A. (-1)

B. 0

C. 1

D. None of these

Answer: C

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111. If $|z + \bar{z}| = |z - \bar{z}|$, then the locus of z is

A. pair of straight lines

B. a rectangular hyperbola

C. a line

D. None of these

Answer: A

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112. If $\log_{\tan 30^\circ}\left(\frac{2|z|^2 + 2|z| - 3}{|z| + 1}\right) < (-2)$, then

A. $|z| < \frac{3}{2}$

B. $|z| > \frac{3}{2}$

C. $|z| > 2$

D. $|z| < 2$

Answer: C

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113. The number of solutions of the equation $z^2 + |z|^2 = 0$, where $z \in c$ is

A. one

B. two

C. three

D. infinite

Answer: D

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

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

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

Answer: A

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115. The number of roots of the equation $z^{15} = 1$ satisfying $|argz| < \frac{\pi}{2}$ are

A. 6

B. 7

C. 8

D. None of these

Answer: B

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116. If $A(z_1), B(z_2), C(z_3)$ are the vertices of an equilateral triangle ABC, then $arg\left(\frac{z_2+z_3-2z_1}{z_3-z_2}\right)$ is equal to

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

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

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

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

Answer: B

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117. If 1, ω, ω^2 are the three cube roots of unity, then $(1-\omega+\omega^2)(1-\omega^2+\omega^4)(1-\omega^4+\omega^8)$..... to 2n factors=

A. 2^n

B. $2^2 n$

C. $2^4 n$

D. None of these

Answer: B

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118. If ω is the cube root of unity then $\cos\left[\left(\omega^{200}+\frac{1}{\omega^{200}}\right)\pi+\frac{\pi}{4}\right]$ equals

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

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

C. 1

D. 0

Answer: A

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119. If ω is a complex cube root of unity and $(1+\omega)^7 = A + B\omega$ then A and B are respectively.

A. 0,1

B. 1,1

C. 1,0

D. -1,1

Answer: B

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120. the area of the triangle formed by 1, ω, ω^2 where ω be the cube root of unity is

A. $\sqrt{3}$

B. $3\sqrt{3}$

C. $\dfrac{3\sqrt{3}}{4}$

D. 9

Answer: C

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121. The value of $i^{100} + i^{101} + i^{102} + i^{103}$

A. 1

B. i

C. 0

D. None of these

Answer: C

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122. If $argz < 0$, then arg(-z)-argz is equal to

A. π

B. $-\pi$

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

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

Answer: A

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

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

B. π

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

D. 0

Answer: D

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124. The common roots of the equations $z^3 + 2z^2 + 2z + 1 = 0$ and $z^{1985} + z^{100} + 1 = 0$ are

A. $-1, \omega^2$

B. $-1, \omega$

C. ω, ω^2

D. None of these

Answer: C

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125. $|z - 6| < |z - 2|$ its solution is given by

A. $Re(z) > 0$

B. $Re(z) < 0$

C. $Re(z) > 4$

D. $Re(z) < 4$

Answer: C

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

A. circle

B. a parabola

C. an ellipse

D. None of these

Answer: D

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

A. 0

B. -1

C. 1

D. None of these

Answer: B

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128. The value of $\left[\frac{1+\cos\left(\frac{\pi}{8}\right)+i\sin\left(\frac{\pi}{8}\right)}{1+\cos\left(\frac{\pi}{8}\right)-i\sin\left(\frac{\pi}{8}\right)}\right]^8$ is

A. 0

B. i

C. 1

D. -1

Answer: D

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129. The area of the triangle in the complex plane formed by the points z, iz and z+iz is

A. $|z|^2$

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

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

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

Answer: B

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130. The origin and the roots of the equation $z^2 + pz + q = 0$ form an equilateral triangle if

A. $p^2 = 3q$

B. $p^2 = q$

C. $q^2 = p$

D. $q^2 = 3p$

Answer: A

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131. If n is a positive integer, then, $(1 + i\sqrt{3})^n + (1 - i\sqrt{3})^n =$

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

B. $2^n. \cos\left(\frac{n\pi}{3}\right)$

C. $2^{n+1}. \cos\left(\frac{n\pi}{3}\right)$

D. None of these

Answer: C

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132. 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. scalene triangle

Answer: B

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133. The locus of point z satisfying $Re\left(\frac{1}{z}\right) = k$, where k is a non-zero real number is

A. a straight line

B. a circle

C. an ellipse

D. a hyperbola

Answer: B

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134. If P represents z=x+iy in the argand plane and $|z+1-i| = |z+i-1|$ then locus of P is a/an

A. straight line

B. circle

C. ellipse

D. None of these

Answer: A

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135. If $\frac{\alpha}{a}+\frac{\beta}{b}+\frac{\gamma}{c}=1+i$ and $\frac{a}{\alpha}+\frac{b}{\beta}+\frac{c}{\gamma}=0$, then the value of $\frac{\alpha^2}{a^2}+\frac{\beta^2}{b^2}+\frac{\gamma^2}{c^2}$ is equal to

A. 0

B. -1

C. 2i

D. -2i

Answer: C

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136. The number of solution of the system of equations $Re(z^2)=0, |z|=2$ is

A. 4

B. 3

C. 2

D. 1

Answer: A

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137. z_1, z_2, z_3 are three points lying on the circle $|z| = 1$, maximum value of $|z_1 - z_2|^2 + |z_2 - z_3|^2 + |z_3 - z_1|^2$ is

A. 6

B. 9

C. 12

D. 15

Answer: B

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138. The system of equations $|z+1-i| = \sqrt{2}$, $|z| = 3$ has

A. a unique solution

B. two solution

C. no solution

D. None of these

Answer: C

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139. If $z_1 = a + ib$ and $z_2 = c + id$ are complex numbers such that $|z_1| = |z_2| = 1$ and $Re(z_1 \bar{z}_2) = 0$, then the pair of complex numbers $\omega_1 = a + ic$ and $\omega_2 = b + id$ satisfies:

A. $Re(\omega_1 \overline{\omega}_2) = 1$

B. $|\omega_1| = |\omega_2| = 1$

C. $|\omega_1| = |\omega_2| = 0$

D. $Re(\omega_1\overline{\omega}_2) \neq 0$

Answer: B

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140. If z_1 and z_2 be two complex numbers such that $|z| \leq 1, |z|_2 \leq 1, |z_1 + iz_2| = |z_1 - iz_2| = 2$, then z_1 equals

A. i or i

B. i or -i

C. 1 or -1

D. i or -1

Answer: C

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141. If $z^4 = (z-1)^4$, then the roots are represented in the Argand plane by the points that are:

A. Collinear

B. Concyclic

C. Vertices of a parellelogram

D. None of these

Answer: A

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142. Let $z = 1 - t + i\sqrt{t^2 + t + 2}$, where t is real parameter. The locus of z in the argand plane is

A. a hyperbola

B. an ellipse

C. a straight line

D. None of these

Answer: A

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143. If $|z| = \min\{|z-1|, |z+1|\}$, then

A. $|z+\bar{z}| = \frac{1}{2}$

B. $z+\bar{z} = 1$

C. $|z+\bar{z}| = 1$

D. None of these

Answer: C

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144. If z_1 and z_2 be two complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$ then the value of $argz_1 - argz_2$ is equal to

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

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

C. π

D. 0

Answer: A

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145. if $z^2 + z + 1 = 0,$ then the value of $\left(z + \frac{1}{z}\right)^2 + \left(z^2 + \frac{1}{z^2}\right)^2 + \left(z^3 + \frac{1}{z^3}\right)^2 + \ldots\ldots + \left(z^{21} + \frac{1}{z^{21}}\right)^2$ is

A. 21

B. 42

C. 0

D. None of these

Answer: B

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146. If ω is the imaginary cube root of 1 then prove that $\left(a+b\omega+c\omega^2\right)^3+\left(a+b\omega^2+c\omega\right)^3$= $(2a-b-c)(2b-a-c)(2c-a-b)$

A. (a+b-c)(b+c-a)(c+a-b)

B. (a-b-c)(b-c-a)(c-a-b)

C. (2a-b-c)(2b-c-a)(2c-a-b)

D. None of these

Answer: C

Watch Video Solution

147. If $z_1 = a + ib$ and z_2=c+id, a, b, c, dinR

, $betwocomp \leq x\nu mberssucht$^absz_1=absz_2=1 and Re(z_1barz_2)=0

, $thenf$ or alpha_1=a+ic and alpha_2=b+id`,

A. $|\alpha| - 1 \neq 1$

B. $|\alpha| - 2 \neq 1$

C. $Re(\alpha - 1\overline{\alpha}_2 = 0$

D. $Re(\alpha - 1\overline{\alpha}_2 = 1$

Answer: C

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148. The sum of the series

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

terms 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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149. If $|z-2-2i|=1$, then the minimum value of $|z|$ is

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

B. $2\sqrt{2}$

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

D. $2\sqrt{2}-2$

Answer: A

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150. The point represented by the complex number 2-i is rotated about origin through an angle $\frac{\pi}{2}$ in the clockwise direction. the complex number corresponding to new position of the point is

A. 1+2i

B. -1-2i

C. 2+i

D. -1+2i

Answer: B

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151. z_1 and z_2 be two complex no. then prove that $|z_1 + z_2|^2 + |z_1 - z_2|^2 = 2\left[|z_1|^2 + |z_2|^2\right]$

A. $|z|_2 = 1$

B. $z_2 = 0$

C. $|z|_2 = \alpha$

D. $|z|_2 < \alpha$

Answer: A

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152. For all complex numbers z_1, z_2 satisfying $|z|_1 = 12$ and $|z_2 - 3 - 4i| = 5$, the minimum value of $|z_1 - z_2|$ is

A. 0

B. 2

C. 7

D. 17

Answer: B

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153. if z and w are two non-zero complex numbers such that $|z| = |w|$ and $argz + argw = \pi$, then z=

A. $\overline{w}$

B. -barw

C. w

D. -w

Answer: B

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154. If z_1, z_2, z_3, z_4 represent the vertices of a rhombus in anticlockwise order, then

A. $z_1 - z_2 + z_3 - z_4 = 0$

B. $z_1 + z_2 = z_3 + z_4$

C. $amp\frac{z_2 - z_4}{z_1 - z_3} = \frac{\pi}{2}$

D. $amp\frac{z_1 - z_2}{z_3 - z_4} = \frac{\pi}{2}$

Answer: A::C

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155. If $(x+iy)^7 = a+ib$, then $(y+ix)^7$ is equal to

A. b+ia

B. -(b+ia)

C. -i(a+ib)

D. -a+ib

Answer:

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156. $(1+i)^{n_1} + (1+i^3)^{n_1} + (1+i^5)^{n_2} + (1+i^7)^{n_2}$ is a real number if

A. n_1 is a positive integer

B. n_2 is a positive integer

C. $n - 1 + 1 = n_2$

D. $n_1 = n + 2 + 1$

Answer: A::B

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

A. 0

B. -i

C. i^3

D. i

Answer: B::C

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158. If $\text{amp}(z_1 z_2) = 0$ and $|z|_1 = |z|_2 = 1$, then

A. $z_1 + z_2 = 0$

B. $z + 1 = \bar{z}_2$

C. $z_1 z_2 = 1$

D. $z_1 z_2 = 1 - i$

Answer: B::C

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159. if z_1, z_2, z_3 are the vertices pf an equilateral triangle inscribed in the circle $|z| = 1$ and $z_1 = i$, then

A. $z_2 = -\left(\dfrac{\sqrt{3} + i}{2}\right)$

B. $z_3 = \dfrac{\sqrt{3}}{2} + \dfrac{i}{2}$

C. $z_2 = -\frac{1}{2} - i\frac{\sqrt{3}}{2}$

D. `z_3=(sqrt3-i)/2

Answer: A::D

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160. if amp $\frac{z-1}{z+1} = \frac{\pi}{3}$, then the locus of z is

A. a straight line

B. an arc of a circle

C. major segment of a circle whose chord substends a angle $\frac{2\pi}{3}$ at its centre

D. a pair of lines

Answer: B::C

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161. If $e^{i\alpha} = \cos\alpha + i\sin\alpha$, then for the ΔABC, the value of $e^{\frac{iA}{2}} e^{\frac{iB}{2}} e^{\frac{iC}{2}} =$

A. i

B. -i

C. 1

D. -1/i

Answer: A::D

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162. The equation $z\bar{z} + (4-3i)z + (4+3i)\bar{z} + 5 = 0$ represents a circle of radius

A. $2\sqrt{5}$

B. $\sqrt{5}$

C. 5

D. $\sqrt{20}$

Answer: A::D

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163. 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. $\begin{bmatrix} z - z_1 \\ z_2 - z_1 \end{bmatrix} \begin{bmatrix} \bar{z} - \bar{z}_1 \\ \bar{z}_2 - z_1 \end{bmatrix}$=0

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

Answer: A::C::D

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164. The roots of the equation $Z^3 + 1 = 0$ are called cube roots of unity.Clearly Z=-1 is a root and the other roots are complex comjugate root and they are $\omega = \cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)$ and $\omega^2 = \cos\left(\frac{4\pi}{3}\right) + i\sin\left(\frac{4\pi}{3}\right)$

$1 + \omega + \omega^2 = 0$

$\left(1 + \omega^2\right)^7 + (1 + \omega)^7$ equals

A. 0

B. (-1)

C. 1

D. 1

Answer: B

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165. The roots of the equation $Z^3 + 1 = 0$ are called cube roots of unity.Clearly Z=-1 is a root and the other roots are complex comjugate root and they are $\omega = \cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)$ and $\omega^2 = \cos\left(\frac{4\pi}{3}\right) + i\sin\left(\frac{4\pi}{3}\right)$

$1 + \omega + \omega^2 = 0$

$(1 + \omega^2)^7 + (1 + \omega)^7$ equals

A. 0

B. 1

C. (-1)

D. (-i)

Answer: B

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166. Let $A(z_1)$, $B(z_2)$ and $C(z_3)$ be the three points in Argands plane

The point A B and C are collinear if

A. $z_1 + z_2 + z_3 = 0$

B. $|z_3 - z_1| = |z_3 - z_2|$

C. $z_3 - z_1 = z_2 - z_3$

D. None of these

Answer: B

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167. Let $A(z_1), B(z_2)$ and $C(z_3)$ be the three points in Argands plane

The point A B and C are collinear if

A. $|z_3 - z_1| = |z_3 - z_2|$

B. $z_1 + z_2 + z_3 = 0$

C. `arg((z_3-z_1)/(z_2-z_1))=0

D. None of these

Answer: C

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168. Match List - I with List-II

List - I	List - II
(1) Circular plate is expanded by heat from radius 5 cm to 5.06 cm. Approximate increase in area is	(P) 4
(2) If an edge of a cube increases by 1%, then percentage increase in volume is	(Q) 0.6π
(3) If the rate of decrease of $\frac{x^2}{2} - 2x + 5$ is twice the rate of decrease of x, then x is equal to (rate of decreases is non-zero)	(R) 3
(4) Rate of increase in area of equilateral triangle of side 15 cm, when each side is increasing at the rate of 0.1 cm/s, is	(S) $\frac{3\sqrt{3}}{4}$

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(4) Rate of increase in area of equilateral triangle of side 15 cm, when each side is increasing at the rate of 0.1 cm/s, is	(S) $\frac{3\sqrt{3}}{4}$

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170. If $Arg z < 0$ then $\frac{Arg(-z) - Arg(z)}{\pi\left(\cos\left(\frac{\pi}{3}\right)\right)}$ is equal to

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171. If s(n)=$i^n + i^{-n}$ where $i = \sqrt{-1}$ and n is an integer then the total number of distinct values of S(n) is

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172. Let ω be the complex number $\cos\left(2\frac{\pi}{3}\right) + i\sin\left(2\frac{\pi}{3}\right)$ Then the number of distinct complex numbers z satisfying $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & (z+\omega^2) & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0$ is equals to

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173. if z is any complex number satisfying $|z-3-2i| \le 2$ then the minimum value of $|2z-6+5i|$ is

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174. If ω is a nonreal cube root of unity then

$\frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2}+\frac{c+a\omega+b\omega^2}{a+b\omega+c\omega^2}+\frac{b+c\omega+a\omega^2}{b+c\omega^4+a\omega^5}$ is equal to

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175. If $(\cos\alpha+\cos\beta+\cos\gamma)=0, \sin\alpha+\sin\beta+\sin\gamma=0$ then show that

$\cos 3\alpha+\cos 3\beta+\cos 3\gamma=3\cos(\alpha+\beta+\gamma)$

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176. If $(\cos\alpha+\cos\beta+\cos\gamma)=0, \sin\alpha+\sin\beta+\sin\gamma=0$ then show that

$\sin 3\alpha+\sin 3\beta+\sin 3\gamma=3\sin(\alpha+\beta+\gamma)$

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177. If 1,2,3 and 4 are the roots of the equation $x^4 + ax^3 + bx^2 + cx + d$ =0 then a+2b+c=

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178. If z_1 and z_2 are non zero complex numbers such that $|z_1 - z_2| = |z|_1 + |z|_2$ then

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179. If 1,$\alpha, \alpha^2 \ldots\ldots \alpha^{n-1}$ are the nth roots of unity then prove that $(1-\alpha)(1-\alpha^2)\ldots.(1-\alpha^{n-1}) = n$

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180. Prove that ifz_1, z_2 are two complex numbers and $c > 0$ then

$$\left|(z_1+z_2)^2\right| \leq (1+c)\left|(z_1)^2\right| + \left(1+\left(\frac{1}{c}\right)\right)|z_2|^2$$

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181. If z_1, z_2, z_3 are the vertices of an equilateral triangle with z_0 as its circum centre, the changing origin to z_0 new vertices become $z_1{}', z_2{}', z_3{}'$ show that $z_1{}'^2 + z_2{}'^2 + z_3{}'^2 = 0$

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182. If $\left|z + \left(\frac{1}{z}\right)\right| = a$ where z is a complex number find the least and the greatest values of $|z|$ also find a for which the greatest and the least values of $|z|$ are equal

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183. $A(z_1), B(z_2), C(z_3)$ are the vertices a triangle ABC inscribed in the circle $|z| = 2$ internal angle bosector of the angle A meet the circumference again at $D(z_4)$ then prove $z_4^2 = z_2 z_3$

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184. The roots z_1, z_2, z_3 of the equation $x^3 + 3ax^2 + 3bx + c = 0$ in which a,b,c are complex number correspond to the points A,B,C on the gaussian pllane. Find the centroid of the triangle ABC and show that it will equilateral if $a^2 = b$

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185. Ifa,b,c,p,q,r be six complex numbers such that $\frac{a}{p} + \frac{b}{q} + \frac{c}{r} = 0$and $\frac{p}{a} + \frac{q}{b} + \frac{r}{c} = 1 - i$ then prove that $\left(\frac{p^2}{a^2}\right) + \left(\frac{q^2}{b^2}\right) + \left(\frac{r^2}{c^2}\right) = -2i$

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

A. 2-3/2i

B. 3/2-2i

C. 3/2+2i

D. (-2)+3/2i

Answer: B

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187. The amplitude of $1 + i \tan 3\frac{\pi}{5}$ is

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

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

C. $\frac{-2\pi}{5}$

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

Answer: C

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188. The locus represented by the equation $|z-1|=|z-i|$ is

A. a circle of radius 1

B. an ellipse with foci 1 and (-1)

C. a line through the origin

D. a circle on the line joining 1 and (-1) as diameter

Answer: C

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189. if $x=9^{\frac{1}{3}}9^{\frac{1}{9}}9^{\frac{1}{27}}\ldots\ldots\infty, y=4^{\frac{1}{3}}4^{\frac{1}{9}}4^{\frac{1}{27}}\ldots\ldots\infty$ and $z=\sum_{r=1}^{\infty}(1+i)^{-r}$

then arg(x+yz) is equal to

A. 0

B. $\pi-\tan^{-1}\left(\frac{\sqrt{2}}{3}\right)$

C. $\left(-\tan^{-1}\left(\frac{\sqrt{2}}{3}\right)\right)$

D. None of these

Answer: C

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190. If the fourth roots of unity are z_1, z_2, z_3, z_4 then $z_1^2 + z_2^2 + z_3^2 + z_4^2$ is equal to

A. 1

B. 0

C. i

D. none of these

Answer: B

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191. 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

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

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

C. $i\sqrt{3}$

D. $(-1)\sqrt{3}$

Answer: C

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192. Let z_1 and z_2 be the nth roots of unity which subtend a right angle at the origin then n must be the form

A. 4k+1

B. 4k+2

C. 4k+3

D. 4k

Answer: D

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193. If $x^5 = (4 - 3i)^5$ thrn the product of all of its roots (where $\theta = -\tan^{-1}\left(\frac{3}{4}\right)$

A. $5^5(\cos 5\theta + i \sin 5\theta)$

B. $(-5)^5(\cos 5\theta + i \sin 5\theta)$

C. $5^5(\cos 5\theta - i \sin 5\theta)$

D. $(-5)^5(\cos 5\theta - i \sin 5\theta)$

Answer: B

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194. If ω is an imaginary x^n root of unit then $\sum_{r=1}^{n}(ar+b)\omega^{r-1}$ is

A. $n(n+1)\dfrac{a}{\omega}$

B. nb/(1-n)

C. $n\dfrac{a}{\omega-1}$

D. none of these

Answer: C

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195. If $\omega(\neq 1)$ be 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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196. If $|z| = 1$ and $z \neq \pm 1$ then all the values of $\frac{z}{1 - z^2}$ lie on

A. a line not passing through the origin

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

C. the x axis

D. the y axis

Answer: D

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197. If $\frac{1 + 2i}{2 + i} = r(\cos\theta + i\sin\theta)$ then

A. r=1,$\theta = \tan^{-1}\left(\frac{3}{4}\right)$

B. $r = \sqrt{5}$,theta=tan^(-1)4/3`

C. r=1,$\theta = \frac{\tan^{-1} 4}{3}$

D. none of these

Answer: A

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198. If $z_1 = a + ib$ and $z_2 = c + id$ are two complex numbers lying on the circle $x^2 + y^2 = 1$ in the argand diagram and $Re(z_1 \bar{z}_2) = 0$ then the complex numbers $\omega_1 = (a + ic)$ and $\omega_2 = b + id$ are such that

A. only ω_1 lies on the circle$x^2 + y^2 = 1$

B. only ω_2 lies on the circle $x^2 + y^2 = 1$

C. $Re(\omega_1 \omega_2) = 0$

D. none of these

Answer: C

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199. Number of solution(s) of the equation $|z|^2 + 7z = 0$ is/are

A. 1

B. 2

C. 4

D. 6

Answer: B

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200. 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)+-2i

C. (-2)+-i

D. none of these

Answer: B

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201. Let z_1, z_2, z_3 be three points on $|z| = 1$ let θ_1, θ_2 and θ_3 be the argument of z_1, z_2, z_3 then $\cos(\theta_1 - \theta_2) + \cos(\theta_2 - \theta_3) + \cos(\theta_3 - \theta_2)$

A. $\geq \left(-\frac{3}{2}\right)$

B. $\leq \left(-\frac{3}{2}\right)$

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

D. none of these

Answer: A

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202. If z_1, z_2 are two non zero complex numbers such that $\frac{z_1}{z_2} + \frac{z_2}{z_1} = 1$ then z_1, z_2 and the origin are

A. collinear

B. from right angled triangle

C. form the right angle isosceles triangle

D. form an equilateral triangle

Answer: D

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203. The complex numbers 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 verticles 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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204. Let $A(z_1), A_2(\bar{z}_1)$ are the adjacent vertices of a regular polygon if $\frac{Im(\bar{z}_1)}{Re(z_1)} = 1 - \sqrt{2}$ then number of sides of the polygon is equal to

A. 6

B. 8

C. 12

D. 16

Answer: B

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205. If the points A(z),B(-z),C(1-z) are the vertices of an equilateral triangle ABC then Re(z) is

A. (1/4)

B. $\frac{\sqrt{3}}{2}\Bigg)$

C. (1/2)

D. none of these

Answer: A

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206. Let $z_1 \neq z_2$ are two points in the Argand plane if $a|z_1| = b|z_2|$ then point $\frac{az_1 - bz_2}{az_1 + bz_2}$ lies

A. in 1st quadrant

B. in 2nd quadrant

C. on real axis

D. on imaginary axis

Answer: D

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207. The least positive integer n for which $\left(\frac{1+i}{1-i}\right)^n = \frac{2}{\pi}\sin^{-1}\left(\frac{1+x^2}{2x}\right)(x \geq 0)$ is

A. 0

B. 2

C. 4

D. 8

Answer: C

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208. If x=2+5i then the value of the expression $x^3 - 5x^2 + 33x - 49$ is

A. (-20)

B. 10

C. 20

D. (-29)

Answer: A

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209. The square root of (1+i) is

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

B. $\pm \frac{\sqrt{2}+1+i\left(\sqrt{2}-1\right)}{\sqrt{2}}$

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

D. none of these

Answer: D

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210. The curve represented by $Im(z^2) = c^2$ is

A. rectangular hyperbola

B. a circle

C. a parabola

D. an ellipse

Answer: A

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211. If z be a complex number satisfying $z^4 + z^3 + 2z^2 + z + 1 = 0$ then $|z|$ is equal to

A. (1/2)

B. (3/4)

C. 1

D. none of these

Answer: C

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212. If ω is complex cube root of unity then $\left(3+5\omega+3\omega^2\right)^2+\left(3+3\omega+5\omega^2\right)^2$ is equal to

A. 4

B. 0

C. (-4)

D. none of these

Answer: C

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213. Let $0 \leq \alpha \leq \frac{\pi}{2}$ be a fixed angle.if $p = (\cos\theta, \sin\theta)$ and $Q = (\cos(\alpha - \theta), \sin(\alpha - \theta))$ then Q is obtained from P by

A. clockwise rotation around origin through angle α

B. anticlockwise rotation around origin through an angleα

C. reflection in the line through origin will slope$\tan\theta$

D. reflection in the line through origin with slope $\tan\left(\frac{\alpha}{2}\right)$

Answer: D

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214. A man walks a distance of 3 units from the origin towards the north east $(N45^\circ E)$ direction.from there he walks a distance of 4 units towards the north west $(N45^\circ W)$ direction of reach a point P then the position of P in the Argand plane is :

A. $\frac{3^{i\pi}}{4}\Big)$

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

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

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

Answer: D

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215. $z^2 + z|z| + |z|^2 = 0$ then the locus of z is

A. a circle

B. a straight line

C. a pair of staright line

D. none of these

Answer: C

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216. The polynomial $x^6 + 4x^5 + 3x^4 + 2x^3 + x + 1$ is divisible by

A. $x + \omega$

B. $x + \omega^2$

C. $(x + \omega)(x + \omega^2)$

D. $(x - \omega)(x - \omega^2)$

Answer: D

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217. If z_1, z_2, z_3 are three complex numbers and A= $\begin{vmatrix} arg z_1 & arg z_2 & arg z_3 \\ arg z_2 & arg z_3 & arg z_1 \\ arg z_3 & arg z_1 & arg z_2 \end{vmatrix}$ then A is divisible by`

A. $arg(z_1 + z_2 + z_3)$

B. $arg(z_1 z_2 z_3)$

C. all numbers

D. cannot say

Answer: B

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218. If $|z-i| \leq 2$ and $z_0 = 5 + 3i$ then the maximum value of $||i|z + z_0|$ is

A. $2 + \sqrt{31}$

B. 7

C. $\sqrt{31} - 2$

D. none of these

Answer: B

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219. If $z(Rez \neq 2)$ be a complex number such that $z^2 - 4z = |z|^2 + \frac{16}{|z|^3}$ then the value of $|z|^4$ is

A. 2

B. 4

C. 8

D. 1

Answer: B

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220. 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 $z\bar{z}^3 + \bar{z}z^3 = 350$ is

A. 48

B. 32

C. 40

D. 80

Answer: A

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221. If z and w are two nonzero complex numbers such the $|zw| = 1$ and $arg(z) - arg(w) = \frac{\pi}{2}$ then $\bar{z}w$ is equal to

A. 1

B. (-1)

C. i

D. (-i)

Answer: D

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222. if $\log_{\frac{1}{2}}\left(\frac{|z|^2+2|z|+4}{2|z|^2+1}\right) < 0$ 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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223. If $|z-2-i| = |z|\left|\sin\left(\frac{\pi}{4} - argz\right)\right|$ then locus of z is

A. a pair of straight lines

B. circle

C. parabola

D. ellipse

Answer: C

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224. If $z = \dfrac{3}{2 + \cos\theta + i\sin\theta}$ then show that z lies on a circle in the complex plane

A. a straight line

B. a circle having centre on y axis

C. a parabola

D. a circle having centre on x axis

Answer: D

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225. If $z = i\log_e\left(2 - \sqrt{3}\right)$ then the value of cosz

A. 2

B. (-2)

C. 2i

D. (-2i)

Answer: A

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226. If α is the nth root of unity then $1 + 2\alpha + 3\alpha^2 + \ldots.$ to n terms 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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227. If $a = \cos\alpha + i\sin\alpha, b = \cos\beta + i\sin\beta, c = \cos\gamma + i\sin\gamma$ and $\frac{b}{c} + \frac{c}{a} + \frac{a}{b} = 1$, then $\cos(\beta - \gamma) + \cos(\gamma - \alpha) + \cos(\alpha - \beta)$=

A. (3/2)

B. (-3/2)

C. 0

D. 1

Answer: D

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228. 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. (1/2)

B. (-1/2)

C. 0

D. none of these

Answer: B

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229. If z be any complex number such that $|3z-2|+|3z+2|=4$ then locus of z is

A. an ellipse

B. a circle

C. a line segment

D. none of these

Answer: C

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230. $x^{3m}+x^{3n-1}+x^{3r-2}$ where m,n,r in N` is divisible by

A. x^2-x+1

B. x^2+x+1

C. x^2+x-1

D. x^2-x-1

Answer: B

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231. A fourth root of -1 is

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

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

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

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

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

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232. If $z_1 = a + ib$ and $z_2 = c + id$ are complex numbers such that $|z_1| = |z_2| = 1$ and $Re(z_1 \bar{z}_2) = 0$, then the pair of complex numbers $\omega_1 = a + ic$ and $\omega_2 = b + id$ satisfies:

A. $|\omega|_1 = 1$

B. $|\omega|_2 = 1$

C. $Re(\omega_1 \overline{\omega}_2) = 0$

D. none of these

Answer: A::B::C

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233. Let z_1 and z_2 be complex numbers such that $z_1 \neq z_2$ and $|z|_1 = |z|_2$ if z_1 has positive real part then $\frac{z_1 + z_2}{z_1 - z_2}$ may be

A. zero

B. real and positive

C. real and negative

D. purely imaginary

Answer: A::D

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234. If $(x+2)^3 - 27 = 0$ then a value of x is

A. $(-2) + 3\omega^2$

B. 1

C. $(-2) + 3\omega$

D. ω

Answer: A::B::C

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235. If $|\omega| = 1$ then the set of points $z = \omega + \frac{1}{\omega}$ is contained in or equal to

A. an ellipse with eccentrity4/5

B. the set of points z satisfying Imz=0

C. the set of points z satisfying $|R|ez \leq 2$

D. none of these

Answer: A::C

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236. If z_1 lies on $|z| = 1$ and z_2 lies on $|z| = 2$ then

A. $3 \leq |z_1 - 2z_2| \leq 5$

B. $1 \leq |z_1 + z_2| \leq 3$

C. $|z_1 - 3z_2| \leq 5$

D. $2 \leq |z_1 + z_2| \leq 4$

Answer: A::B::C

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237. If $A(z_1), B(z_2), C(z_3)$ and $D(z_4)$ be the vertices of the square ABCD then

A. $|z_3 - z_1| = |z_4 - z_2|$

B. (z_1-z_2)/(z_3-z_4) is purely real

C. (z_1-z_2)/(z_3-z_2)is purely imaginary

D. (z_1-z_3)/(z_2-z_4)is purely imaginary

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

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238. If z_1 and z_2 are non zero complex numbers such that $|z_1 - z_2| = |z|_1 + |z|_2$ then

A. argz_1=argz_2

B. $|argz_1 - argz_2| = \pi$

C. $z_1 + kz_2 = 0$ for some positive real k

D. $z_1\bar{z}_2 + \bar{z}_1 z_2 < 0$

Answer: B

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239. The reflection of the complex number (2-i)/(3+i) where $(i = \sqrt{-1}$in the straight line $z(1+i) = \bar{z}(i-1)$ is

A. (-1-i)/2

B. (-1+i)/2

C. i(i+1)/2

D. (-1)/(1+i)

Answer: B::C::D

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240. If α is a complex constant such that $\alpha z^2 + z + \overline{\alpha} = 0$ has areal root then

A. $\alpha + b\alpha = 1$

B. $\alpha + \overline{\alpha} = 0$

C. $\alpha + \overline{\alpha} = (-1)$

D. the absolute value of the real root is 1

Answer: D

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241. Let A,B,C b ethree sets of complex numbers as defined

$A = \{z : Imz \geq 1\}$

$B = \{z : |z - 2 - i| = 3\}$

$C = \{z : Re((1 - i)z) = \sqrt{2}\}$

The number of elements in the set $A \cap B \cap C$ is

A. 0

B. 1

C. 2

D. ∞

Answer: B

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242. Let A,B,C b ethree sets of complex numbers as defined

$A = \{z : Imz \geq 1\}$

$B = \{z : |z - 2 - i| = 3\}$

$C = \left\{z : Re((1 - i)z) = \sqrt{2}\right\}$

Let z be any point in $A \cap B \cap C$ then $|z + 1 - i|^2 + |z - 5 - i|^2$ lies between

A. 25 and 29

B. 30 and 34

C. 35 and 39

D. 40 and 44

Answer: C

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243. Let $\alpha + i\beta$ be a complex number and let $x + iy = e^{\alpha + i\beta}$ where $(x, y, \alpha, \beta \in R)$ then we define $\log_e(x + iy) = \alpha + i\beta$

$x + iy = re^{i\theta}$,where

$r = \sqrt{x^2 + y^2}, \theta = \tan^{-1}\left(\frac{y}{x}\right), \alpha + i\beta = \log_e(x + iy) = \log_e\left(r. e^{i\theta} = \log\right.$

so $\log_e(x + iy) = \log_e r + i\theta$

$\log_e(z) = \log_e|z| + iarg(z)$

if $\sin(\log_e i) = a + ib$ then value of a and b is

A. a=(-1),b=0

B. a=1,b=0

C. a=0,b=(-1)

D. a=0,b=1

Answer: A

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244. Let $\alpha + i\beta$ be a complex number and let $x + iy = e^{\alpha + i\beta}$ where $(x, y, \alpha, \beta \in R)$ then we define $\log_e(x + iy) = \alpha + i\beta$

$x + iy = re^{i\theta}$,where

$r = \sqrt{x^2 + y^2}, \theta = \tan^{-1}\left(\frac{y}{x}\right), \alpha + i\beta = \log_e(x + iy) = \log_e\left(r. e^{i\theta} = \log\right.$

so $\log_e(x + iy) = \log_e r + i\theta$

$\log_e(z) = \log_e|z| + iarg(z)$

$\log_e(-i)$ equals

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

B. πi

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

D. 0

Answer: C

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245. If α is non real fourth root of unity , then value of, $\alpha^{4n-1}+\alpha^{4n-2}+\alpha^{4n-3}$, n∈N

A. 0

B. 3

C. -1

D. none of these

Answer: B

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246. Let $\alpha \neq 1$ be an nth root of unity where n is a prime natural number $(3+\alpha)(3+\alpha_2)(3+\alpha_3)\ldots(3+\alpha_{n-1})$ is equal to

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247. If $\cos\left(\frac{\pi}{7}\right), \cos\left(\frac{3\pi}{7}\right), \cos\left(\frac{5\pi}{7}\right)$ are the roots of the equation $8x^3-4x^2-4x+1=0$

The value of $\sec\left(\frac{\pi}{7}\right)+\sec\left(\frac{3\pi}{7}\right)+\sec\left(\frac{5\pi}{7}\right)$ is

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248. The complex numbers z is simultaneously satisfy the equations $\frac{|z-12|}{|z-8i|}=\frac{5}{3}, \frac{|z-4|}{|z-8|}=1$ then the Re(z) is

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249. The smallest positiv einteger n for which $\left(\frac{1+i}{1-i}\right)^n = 1$ where $i = \sqrt{-1}$ is

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250. If $|z| \geq 3$ then the least value of $\left|z + \frac{i}{z}\right|$ is $\frac{\lambda}{3}$ then the value of λ is

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251. If $|z-1| + |z+3| \leq 8$ then possible value of $|z-4|$ is

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252. A complex number z is said to be unimodular if $|z| = 1$ suppose z_1 and z_2 are complex numbers such that $\frac{z_1 - 2z_2}{2 - z_1 z_2}$ is unimodular and z_2 in not unimodular then the point z_1 lies on a

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253. It is given that n is an odd integer greater than 3 but n is not a multiple of 3 prove that $x^3 + x^2 + x$ is a factor of $(x+1)^n - x^n - 1$:

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254. Find the real values of x and y for which the following equation is satisfied: $\frac{(1+i)x - 2i}{3+i} + \frac{(2-3i)y + i}{3-i} = i$

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255. Let the complex numbers z_1, z_2 and z_3 be the vertices of an equilateral triangle let z_0 be the circumcentre of the triangle then prove that $z_1^2 + z_2^2 + z_3^2 = 3z_0^2$

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256. If in argand plane the vertices A,B,C of an isoceles triangle are represented by the complex nos z_1, z_2, z_3 respectively where $\angle C = 90^\circ$ then show that $(z_1 - z_2)^2 = 2(z_1 - z_3)(z_3 - z_2)$

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257. let $z_1 = 10 + 6i$ and $z_2 = 4 + 6i$ if z is nay complex number such that argument of $\frac{z - z_1}{z - z_2}$ is $\frac{\pi}{4}$ the prove that $|z - 7 - 9i| = 3\sqrt{2}$

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258. if $iz^3 + z^2 - z + i = 0$ then show that $|z| = 1$

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259. let z_1 and z_2 be roots of the equation $z^2 + pz + q = 0$ where the coefficients p and q may be complex numbers let A and B represnts z_1

and z_2 in the complex plane if $\angle AOB = \alpha \neq 0$ and OA=OB where 0 is the origin prove that $p^2 = 4q\cos^2\left(\frac{\alpha}{2}\right)$

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260. For complex numbers z and w prove that $|z|^2 w - |w|^2 z = z - w$ if and only if z=w or $z\overline{w} = 1$

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261. if z_1 and z_2 are two complex numbers such that $|z|_1 < 1 < |z|_2$ then prove that $\frac{|1 - z_1\bar{z}_2|}{|z_1 - z_2|} < 1$

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262. find the centre and radius of the circle formed by all the points represented by z=x+iy satisfying the relation $\left|\frac{z-\alpha}{z-\beta}\right| = k(k \neq 1)$ where

α and β are constant complex numbers given by $\alpha = \alpha_1 + I\alpha_2, \beta = \beta + i\beta_2$

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263. Let $\omega \neq 1$ be a complex cube root of unity if $(3 - 3\omega + 2\omega^2)^{4n+3} + (2 + 3\omega - 3\omega^2)^{4n+3} + (-3 + 2\omega + 3\omega^2)^{4n+3} = 0$ then possible value(s) of n is (are)

A. 1

B. 2

C. 4

D. 3

Answer: D

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264. For any integer k let $\alpha_k = \cos\left(\frac{k\pi}{7}\right) + i\sin\left(\frac{k\pi}{7}\right)$ where $i = \sqrt{-1}$ the value of expression $\frac{\sum_{k=1}^{12} |\alpha_{k+1} - \alpha_k|}{\sum_{k=1}^{3} |(\alpha_{4k-1} - \alpha_{4k-2})|}$

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265. A complex number z is said to be unimodular if $|z| = 1$ suppose z_1 and z_2 are complex numbers such that $\frac{z_1 - 2z_2}{2 - z_1 z_2}$ is unimodular and z_2 in not unimodular then the point z_1 lies on a

A. straight line parallel to y axis

B. circle of radius 2

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

D. straight line parallel to x axis

Answer: B

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266. The value of $\left(\frac{1+\sqrt{3}i}{1-\sqrt{3}i}\right)^{64}+\left(\frac{1-\sqrt{3}i}{1+\sqrt{3}i}\right)^{64}$

A. zero

B. (-1)

C. 1

D. i

Answer: B

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267. Find the maximum value of $|z|$ when $\left|z-\frac{3}{z}\right|=2$,z being a complex number

A. $1+\sqrt{3}$

B. 3

C. $1+\sqrt{2}$

D. 1

Answer: B

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

A. is strictly greater than 5/2

B. is strictly greater than 3/2 but less than 5/2

C. is equal to 5/2

D. lies in the interval (1,2)

Answer: D

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269. Let z_1, z_2 be two fixed complex numbers in the Argand plane and z be an arbitary point satisfying $|z - z_1| + |z - z_2| = 2|z_1 - z_2|$ then the locus of z will be

A. an ellipse

B. a straight line joining z_1and z_2

C. a parabola

D. a bisector of the line segment joining z_1 and z_2

Answer: A

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270. In the Argand plane the distinct roots of $1 + z + z^3 + z^4 = 0$ (z is a complex number) represent vertices of

A. a square

B. an equilateral triangle

C. a rhombus

D. a rectangle

Answer: B

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271. Suppose that z_1, z_2, z_3 are three vertices of an equilateral triangle in the Argand plane let $\alpha = \frac{1}{2}(\sqrt{3} + i)$ and β be a non zero complex number the point $\alpha z_1 + \beta, \alpha z_2 + \beta, \alpha z_3 + \beta$ wil be

A. the vertices of an equilateral triangle

B. the vertices of an isosceles triangle

C. collinear

D. the vertices of a scalene triangle

Answer: A

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272. The value of $|z|^2 + |z-3|^2 + |z-i|^2$ is minimum when z equals

A. 2-(2/3)i

B. 45+3i

C. 1+(i/3)

D. 1-(i/3)

Answer: C

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273. Let z_1 be a fixed point on the circle of radius 1 centered at the origin in the Argand plane and $z_1 \neq \pm 1$ consider an equilateral triangle inscribed in the circle with z_1, z_2, z_3 as the vertices taken in the counter clockwise directtion then $z_1 z_2 z_3$ is equal to

A. z_1^2

B. z_1^3

C. z_1^4

D. z_1

Answer: B

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274. Let α, β denote the cube roots of unity other than 1 and $\alpha \neq \beta$ let

$S = \sum_{n=0}^{302} (-1)^n \left(\frac{\alpha}{\beta}\right)^n$ then the value of S is

A. either -2ω or $-2\omega^2$

B. $either(-2\omega)$ or $2\omega^2$

C. either 2ω or $(-2\omega^2)$

D. either2ω or $2\omega^2$

Answer: A

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275. Let complex numbers α and $\frac{1}{\alpha^{-}}$ lie on circles $(x-x_0)^2+(y-y_0)^2=r^2$ and $(x-x_0)^2+(y-y_0)^2=4r^2$ respectively if $z_0=x_0+iy_0$ satisfies the equation $2|z|_0^2=r^2+2$ then $|\alpha|=$

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

B. (1/2)

C. $\frac{1}{\sqrt{7}}$

D. (1/3)

Answer: C

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276. If z is a complex number of unit modulus and argument theta then arg((1+z)/(1+zbar)) equals

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

B. θ

C. $\pi - \theta$

D. $(- \theta)$

Answer: B

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277. Let $z_1 = 2 + 3i$and $z_2 = 3 + 4i$ be two points on the complex plane then the set of complex numbers z satisfying $|z - z_1|^2 + |z - z_2|^2 = |z_1 - z_2|^2$ represents

A. a straight line

B. a point

C. a circle

D. a pair of straight lines

Answer: C

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278. Suppose z=x+iy where x and y are real numbers and $i=\sqrt{-1}$ the points (x,y) for which (z-1)/(z-i) is real lie on

A. an ellipse

B. a circle

C. a parabola

D. a straight line

Answer: D

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279. If P,Q,R are angles of an isosceles triangle and $\angle p=\frac{\pi}{2}$ then the value of

$\left(\cos\left(\frac{p}{3}\right)-i\sin\left(\frac{p}{3}\right)\right)^3+(\cos Q+i\sin Q)(\cos R-i\sin R)+(\cos P_i\sin$

is equal to

A. i

B. (-i)

C. 1

D. (-1)

Answer: B

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280. Let z be a complex 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. (1/3)

C. (1/2)

D. (3/4)

Answer: D

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281. 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 orogin

D. on the imaginary axis

Answer: A

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282. The maximum value of $|z|$ when the complex number z satisfies the condition $\left|z-\left(\frac{2}{z}\right)\right|$=2 is

A. $\sqrt{3}$

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

C. $\sqrt{3}+1$

D. $\sqrt{3}-1$

Answer: C

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283. If $\left(\frac{3}{2}+i\frac{\sqrt{3}}{2}\right)^{50}=3^{25}(x+iy)$where x and y are real then the order Pair (x,y) is

A. (-3,0)

B. (0,3)

C. (0,(-3))

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

Answer: D

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284. If (z-1)/(z+1) is purely imaginary then

A. $|z| = \frac{1}{2}$

B. $|z| = 1$

C. $|z| = 2$

D. $|z| = 3$

Answer: B

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285. The points representing the complex number z for which $arg\left(\frac{z-2}{z+2}\right)=\frac{\pi}{3}$ lie on

A. a circle

B. a straight line

C. an ellipse

D. parabola

Answer: A

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286. if z is any complex number satisfying $|z-3-2i|\leq 2$ then the minimum value of $|2z-6+5i|$ is

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287. Let $\omega = e^{i\frac{\pi}{3}}$,and a,b,c,x,y,z be non zero complex numbers such that

$a + b + c = x$

$a + b\omega + c\omega^2 = y$

$a + b\omega^2 + c\omega = z$ then the value of $\frac{|x|^2 + |y|^2 + |z|^2}{|a|^2 + |b|^2 + |c|^2}$ is

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

A. (1,1)

B. (1,0)

C. (-1,1)

D. (0,1)

Answer: A

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289. For the real parameter t,the locus of the complex number $z = (1 - t^2) + i\sqrt{1 + t^2}$ in the complex plane is

A. an ellipse

B. a parabola

C. a circle

D. a hyperbola

Answer: B

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290. If $x + \left(\frac{1}{x}\right) = 2\cos\theta$ then for any integer n,$x^n + \frac{1}{x^n} =$

A. $2\cos n\theta$

B. $2\sin n\theta$

C. $2i\cos n\theta$

D. $2i \sin n\theta$

Answer: A

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291. If $\omega \neq 1$ is a cube root of unity then the sum of the series $S = 1 + 2\omega + 3\omega^2 + \ldots. + 3n\omega^{3n-1}$ is

A. $3\frac{n}{\omega - 1}$

B. $3n(\omega - 1)$

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

D. 0

Answer: A

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