



MATHS

BOOKS - DEEPTI MATHS (TELUGU ENGLISH)

COMPLEX NUMBERS

Solved Examples

1. If $-3 + ix^2y$ and $x^2 + y + 4i$ are conjugate complex numbers, then x
=

A. 0

B. ± 1

C. ± 3

D. ± 4

Answer: B



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

A. $\sqrt{3} - 1$

B. $\sqrt{3}$

C. $\sqrt{3} + 1$

D. $\sqrt{3} + 2$

Answer: C



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3. If ω a complex cube root of unity, then

$$(2 - \omega)(2 - \omega^2) + 2(3 - \omega)(2 - \omega^2) + \dots + (n - 1)(n - \omega)(2 - \omega^2)$$

A. $\frac{n(n - 1)}{4}$

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

C. $\frac{n(n+1)(2n+1)}{4}$

D. $\frac{n(n+1)(n+3n+4)}{4}$

Answer: D



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4. If a complex number z satisfies the relation $z^2 + z^{-2} = 2$, then the locus of z is

A. a straight line

B. a circle

C. a parabola

D. a hyperbola

Answer: D



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5. If $z = 1 + i\sqrt{3}$ then match the following

- I. $Arg(z)$ a) $5\pi/6$
II. $Arg(iz)$ b) $-\pi/3$
III. $Arg(\bar{z})$ c) π
IV. $Arg(i\bar{z})$ d) $\pi/6$
e) $\pi/3$

A. $A \rightarrow 4, B \rightarrow 1, C \rightarrow 2, D \rightarrow 3$

B. $A \rightarrow 4, B \rightarrow 2, C \rightarrow 1, D \rightarrow 3$

C. $A \rightarrow 3, B \rightarrow 2, C \rightarrow 1, D \rightarrow 4$

D. $A \rightarrow 4, B \rightarrow 1, C \rightarrow 2, D \rightarrow 3$

Answer: D



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6. Let z_1, z_2 be the roots of the equation $z^2 + pz + q = 0$, p, q are complex numbers. Suppose A and B represent z_1 and z_2 in the complex plane. If $\angle AOB = \alpha (\neq 0)$ and $OA = OB$ (where O is the origin) then $p^2 =$

A. $4q \cos\left(\frac{\alpha}{2}\right)$

B. $4q \cos^2(\alpha/2)$

C. $4q^2 \cos\left(\frac{\alpha}{2}\right)$

D. $2q^2 \cos^2\left(\frac{\alpha}{2}\right)$

Answer: B



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7. If z is a complex number, then the locus of z such that :

List I

List II

(A) $|z| = 1$

(1) Is a straight line

(B) $|z + 2i| + |z - 2i| = 4$

(2) Is a ellipse

(C) $Re(z^2) = 4$

(3) Is a hyperbola

(D) $z\bar{z} = 4$

(4) IS a pair of st. lines

(5) Is a circle

The correct match is

A. $A \rightarrow 2, B \rightarrow 3, C \rightarrow 1, D \rightarrow 4$

B. $A \rightarrow 5, B \rightarrow -3, C \rightarrow 1, D \rightarrow 4$

$$C. A \rightarrow 5, B \rightarrow 1, C \rightarrow 3, D \rightarrow 5$$

$$D. A \rightarrow 1, B \rightarrow 2, C \rightarrow 3, D \rightarrow 4$$

Answer: C



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8. Match the items in column I with those in column II. Here $\omega \in 1$ is a cube root of unity .

Column I

(A) The value of $\frac{1}{3}(1 - \omega)(1 - \omega^2)(1 - \omega^4)(1 - \omega^8)$ is

(B) $\omega(1 + \omega - \omega^2)^7 =$

(C) The least positive integer n such that $(1 + \omega^2)^n = (1 + \omega^4)^n$ is

(D) $\frac{1}{1+2\omega} + \frac{1}{2+\omega} - \frac{1}{1+\omega}$ is equal to

Now match for Column I from Column II

A. (A) (B) (C) (D)
 $q \quad s \quad t \quad p$

B. (A) (B) (C) (D)
 $p \quad r \quad s \quad t$

C. (A) (B) (C) (D)
 $t \quad p \quad t \quad s$

D. (A) (B) (C) (D)
 $r \quad t \quad s \quad q$

Answer: C



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Exercise 1

1. The additive inverse of $(1 + 2i)(3 - 4i)$ is

A. $11 + 2i$

B. $11 - 2i$

C. $-11 + 2i$

D. $-11 - 2i$

Answer:



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2. The additive inverse of $\frac{1 + 2i}{1 + i}$ is

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

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

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

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

Answer: A



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3. $\sqrt{-a} \cdot \sqrt{-b} =$

A. \sqrt{ab}

B. $\sqrt{-ab}$

C. $-\sqrt{ab}$

D. \sqrt{abi}

Answer: C



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4. $i^{243} =$

A. $-i$

B. i

C. $2i$

D. i^2

Answer: A



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5. Simplify

$$i^2 + i^4 + i^6 + \dots + (2n + 1) \text{ terms}$$

A. i

B. $-i$

C. 1

D. -1

Answer: D



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6. $1 + i^2 + i^4 + i^6 + \dots + i^{2n} =$

A. positive

B. negative

C. 0

D. cannot be determined

Answer: D



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7. The value of $\sum_{n=1}^{13} (i^n + i^{n+1})$, where $i = \sqrt{-1}$ is

A. i

B. $i - 1$

C. $-i$

D. 0

Answer: B

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8. $(1 - i)(1 + 2i)(1 - 3i) =$

A. $1 - 6i$

B. $8 - 6i$

C. $6 - 8i$

D. $6 + 8i$

Answer: C

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9. The multiplicative inverse of (3,4) is

A. $\left(\frac{3}{25}, \frac{4}{25}\right)$

B. $\left(\frac{3}{25}, -\frac{4}{25}\right)$

C. $\left(-\frac{3}{25}, -\frac{4}{25}\right)$

D. $\left(-\frac{3}{25}, \frac{4}{25}\right)$

Answer: B



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10. The multiplicative inverse of $(4 + 3i)$ is

A. $\frac{4}{25} + \frac{3}{25}i$

B. $\frac{4}{25} - \frac{3}{25}i$

C. $-\frac{4}{25} + \frac{3}{25}i$

D. $-\frac{4}{25} - \frac{3}{25}i$

Answer: B



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11. The multiplicative inverse of $(3 + 4i)i / 25$ is

A. $4 + 3i$

B. $4 - 3i$

C. $-4 - 3i$

D. $-4 + 3i$

Answer: C



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12. Express $(2 - 3i)^3$ in the form of $a + ib$

A. $46 + 27i$

B. $46 - 27i$

C. $-46 + 27i$

D. $-46 - 9i$

Answer: D

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13. Express $\frac{1}{4 - 5i}$ in the form of $a + ib$

A. $\frac{4}{41} + \frac{5}{41}i$

B. $\frac{3}{41} + \frac{4}{41}i$

C. $\frac{2}{41} + \frac{3}{41}i$

D. none

Answer: A

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14. Express $\frac{2 - 3i}{1 + i}$ in the form of $a + ib$

A. $\frac{1}{2} - \frac{5}{2}i$

B. $-\frac{1}{2} - \frac{5}{2}i$

C. $-\frac{1}{2} + \frac{5}{2}i$

D. $\frac{1}{2} + \frac{5}{2}i$

Answer: B



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15. Express $\frac{3 - 2i}{5 + 4i} + \frac{3 + 2i}{5 - 4i}$ in the form of $a + ib$

A. $\frac{14}{41} + i.0$

B. $15 + i.0$

C. $14 - i.0$

D. $15 - i.0$

Answer: A



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16. Express $\left(\frac{a + ib}{a - ib}\right) + \left(\frac{a - ib}{a + ib}\right)$ in the form of $a + ib$

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

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

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

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

Answer: D



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17. $\left(\frac{2 + 3i}{2 - 3i}\right) - \left(\frac{2 - 3i}{2 + 3i}\right)$ in the form of $a + ib$

A. $\frac{24}{13}i$

B. $\frac{27}{13}i$

C. $\frac{28}{13}i$

D. $\frac{30}{13}i$

Answer: A



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

A. $\frac{1}{2} - \frac{i}{2} \cot \left(\frac{\theta}{2} \right)$

B. $\frac{1}{2} - \frac{i}{2} \cos \theta$

C. $\frac{1}{2} - \frac{i}{2} \tan \theta$

D. none

Answer: A



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19. Express $\frac{1}{1 + \cos 2\theta + i \sin 2\theta}$ in the form of $x + iy$

A. $\frac{1}{2} - \frac{i}{2} \sin \theta$

B. $\frac{1}{2} - \frac{i}{2} \cos \theta$

C. $\frac{1}{2} - \frac{i}{2} \tan \theta$

D. none

Answer: C



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20. Express $\frac{1}{1 + \cos 2\theta - i \sin 2\theta}$ in the form of $x + iy$

A. $\frac{1}{2} + \frac{i}{2} \sin \theta$

B. $\frac{1}{2} + \frac{i}{2} \cos \theta$

C. $\frac{1}{2} + \frac{i}{2} \tan \theta$

D. none

Answer: C



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21. Express $\frac{4 + 3i}{(2 + 3i)(4 - 3i)}$ in the form of $x + iy$

A. $\frac{86}{325} + \frac{27}{325}i$

B. $\frac{72}{325} + \frac{27}{325}i$

C. $\frac{68}{325} + \frac{27}{325}i$

D. none

Answer: A



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22. $\frac{1}{i - 1} + \frac{1}{i + 1}$ is

A. purely imaginary

B. positive rational

C. irrational

D. integer

Answer: A

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

A. 0

B. 1

C. 2

D. 4

Answer: C

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24. The modulus of $(-5, 12)$ is

A. 13

B. $\sqrt{13}$

C. $\sqrt{13}/2$

D. $\sqrt{13}/\sqrt{2}$

Answer: A



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25. The modulus of $(-5, 12)$ is

A. 13

B. $\sqrt{13}$

C. $\sqrt{13}/2$

D. $\sqrt{13}/\sqrt{2}$

Answer: A



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26. The modulus of $\frac{5 + 4i}{1 + i}$ is

A. $\sqrt{41}/2$

B. $\sqrt{41}/2$

C. $41/\sqrt{2}$

D. $\sqrt{41}/\sqrt{2}$

Answer: B



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27. The modulus of $\frac{(3 + i)(2 - i)}{1 + i}$ is

A. 5

B. $\sqrt{5}$

C. $5\sqrt{2}$

D. $\sqrt{5}/\sqrt{2}$

Answer: A



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28. The modulus of $\frac{\sqrt{3} + i}{(1 + i)(1 + \sqrt{3}i)}$ is

A. 1

B. $1/2$

C. $\sqrt{2}$

D. $1/\sqrt{2}$

Answer: D



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29. $|1 + \cos \theta + i \sin \theta| =$

A. $\cos(\theta/2)$

B. $\sin(\theta/2)$

C. $2 \sin(\theta/2)$

D. $2 \cos(\theta/2)$

Answer: D



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30. If θ is real then the modulus of $\frac{1}{1 + \cos \theta + i \sin \theta}$ is

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

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

C. $\sec. \frac{\theta}{2}$

D. $\cos. \frac{\theta}{2}$

Answer: A

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31. $\left| \frac{1}{(2+i)^2} - \frac{1}{(2-i)^2} \right| =$

A. $\sqrt{8}/5$

B. $8/25$

C. $25/8$

D. none

Answer: B

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32. If α and β are real then $\left| \frac{\alpha + i\beta}{\beta + i\alpha} \right| =$

A. lies between 0 and 1

B. 1

C. > 1

D. none

Answer: B

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33. The conjugate of $(2, -3) + (3, 4)$ is

A. (5,1)

B. (5,-1)

C. (-5,1)

D. none

Answer: B

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34. The conjugate of $(1 + 2i)(2 - 3i)$ is

A. $-4 + i$

B. $-4, -i$

C. $8 + i$

D. $8 - i$

Answer: D



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35. The conjugate of $\cos \theta - i \sin \theta$ is

A. $\cot \theta + i \sin \theta$

B. $\cos \theta + i \tan \theta$

C. $\tan \theta + i \sin \theta$

D. $\cos \theta + i \sin \theta$

Answer: D



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

A. $x = n\pi$

B. $x = (n + 1/2)\pi$

C. $x = 0$

D. none

Answer: D



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37. The conjugate of $\frac{2 + 3i}{1 + 2i}$ is

A. $\frac{8 + i}{5}$

B. $\frac{8 - i}{5}$

C. $\frac{2 + 3i}{5}$

D. $\frac{2 - 3i}{5}$

Answer: A



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38. The conjugate complex number of $\frac{2 - i}{(1 - 2i)^2}$ is

A. $\frac{2}{25} + \frac{11}{25}i$

B. $\frac{2}{25} - \frac{11}{25}i$

C. $-\frac{2}{25} + \frac{11}{25}i$

D. $-\frac{2}{25} - \frac{11}{25}i$

Answer: D



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

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

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

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

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

Answer: B



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40. The least positive integral value of n for which $\left(\frac{1+i}{1-i}\right)^n = 1$ is

A. 2

B. 3

C. 4

D. 5

Answer: C



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

A. 2

B. 4

C. 6

D. 8

Answer: B



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42. The least positive integer n for which $\frac{(1+i)^n}{((1-i))^{n-2}}$ is a real number is

A. 2

B. 1

C. 3

D. 5

Answer: B



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43. The least positive integral value of n for which $\left(\frac{1-i}{1+i}\right)^{2n} = 1$ is

A. 2

B. 4

C. 6

D. 14

Answer: A



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

- A. $x = 4n$ where n is any positive integer
- B. $x = 2n$ where n is any positive integer
- C. $x = 4n + 1$ where n is any positive integer
- D. $x = 2n + 1$ where n is any positive integer

Answer: A



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45. If $\frac{(1-i)^{2n}}{(1+i)^{2n+1}}$ is real number then

A. $n=1$

B. $n=2$

C. no n exists

D. none

Answer: C

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46. $(1 - i)^6 + (1 - i)^3 =$

A. $1, 2+i$

B. $2 - 10i$

C. $-2 + i$

D. $-2+12i$

Answer: D

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47. If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = a + ib$, then $(a, b) =$

A. 1,1

B. 2,-2

C. 0,-1

D. 0,-2

Answer: D



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

A. (0,0)

B. (3,1)

C. (3,-1)

D. (-3,1)

Answer: C

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

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

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

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

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

Answer: A

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

A. -1

B. 1

C. 2

D. -2

Answer: D



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51. $\frac{(1 + i)^{2016}}{(1 - i)^{2014}} =$

A. $-2i$

B. $2i$

C. 2

D. -2

Answer: A



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52. If $\frac{(1+i)^2}{2-i} = (x+iy)$ then $x+y =$

A. $-2/5$

B. $6/5$

C. $2/5$

D. none

Answer: C



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

A. 1

B. -1

C. 2

D. -2

Answer: A



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54. $x + iy = \frac{1}{1 + \cos \theta + i \sin \theta}$, then $4x^2 =$

A. 0

B. 1

C. 2

D. 3

Answer: B



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55. If $u + iv = \frac{3i}{x + iy + 2}$, then y in terms of u, v is

A. $\frac{3u}{u^2 + v^2}$

B. $\frac{4u}{u^2 + v^2}$

C. $\frac{5u}{u^2 + v^2}$

D. $\frac{2u}{u^2 + v^2}$

Answer: A

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56. If $u + iv = \frac{2 + i}{z + 3}$ and $z = x + iy$ find u, v

A. $\frac{2(x + 3) + y}{(x + 3)^2 + y^2} + i \frac{x - 2y + 3}{(x + 3)^2 + y^2}$

B. $\frac{2(x + 2) + y}{(x + 2)^2 + y^2} + i \frac{x - 2y + 3}{(x + 2)^2 + y^2}$

C. $\frac{2(x + 4) + y}{(x + 4)^2 + y^2} + i \frac{x - 2y + 3}{(x + 4)^2 + y^2}$

D. none

Answer: A

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57. If $\frac{3}{2 + \cos \theta + i \sin \theta} = x + iy$ then $(x-1)(x-3) =$

A. y^2

B. $-y^2$

C. 0

D. 1

Answer: B



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58. If $(1 + \cos \theta + i \sin \theta)(1 + \cos 2\theta + i \sin 2\theta) = x + iy$ then $y =$

A. $x \tan(3\theta/2)$

B. $x \tan(5\theta/2)$

C. $x \tan(7\theta/2)$

D. $x \tan(9\theta/2)$

Answer: A



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59. If $(a + ib)^2 = x + iy$ then $x^2 + y^2 =$

A. 0

B. 1

C. $(a^2 + b^2)^2$

D. $(a^2 - b^2)^2$

Answer: C



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60. If $\sqrt{\left[\frac{a - ib}{c - ib}\right]}$ then $(x^2 + y^2)^2 =$

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

Answer: C



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

- A. 4
- B. 3
- C. 2
- D. 1

Answer: A



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62. If $\frac{(2 + 3i)}{(7 - i)(4 - 2i)} = A + iB$ then $A^2 + B^2 =$

A. $13/100$

B. $13/1000$

C. $17/100$

D. $17/1000$

Answer: B



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

A. 1

B. -2

C. 2

D. -1

Answer: B



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64. If $z = x + iy$ is a complex number such that $z^{1/3} = a + ib$, then the value of $\frac{1}{(a^2 + b^2)} \left(\frac{x}{a} + \frac{y}{b} \right) =$

A. -1

B. -2

C. 0

D. 2

Answer: B



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65. If $(1 - i)(1 - 2i)(1 - 3i)\dots(1 - ni) = x - iy$, then

$$2.5.10\dots(1 + n^2) =$$

A. $x^2 + y^2$

B. $x + y$

C. $x^2 - y^2$

D. $x - y$

Answer: A



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66. If

$$(a_1 + ib_1)(a_2 + ib_2)\dots(a_n + ib_n) = A + iB, \text{ then } (a_1^2 + b_1^2)(a_2^2 + b_2^2)$$

A. $A^2 + B^2$

B. $A^2 - B^2$

C. $A^3 + B^3$

D. $A^3 - B^3$

Answer: A



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67. If $|z_1| = 1$, $|z_2| = 2$, $|z_3| = 3$ and $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 12$, then the value of $|\bar{z}_1 + \bar{z}_2 + \bar{z}_3|$ is

A. 3

B. 4

C. 8

D. 2

Answer: D



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68. If $(1 + \cos \theta - i \sin \theta)(1 + \cos 2\theta + i \sin 2\theta) = x + iy$ then $x^2 + y^2 =$

A. $16 \cos^2 \theta \sin^2(\theta/2)$

B. $16 \sin^2 \theta \cos^2(\theta/2)$

C. $16 \sin^2 \theta \sin^2(\theta/2)$

D. $16 \cos^2 \theta \cos^2(\theta/2)$

Answer: D



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69. $\sqrt{-5 + 12i} =$

A. $\pm(2 + 3i)$

B. $\pm(2 - 3i)$

C. $\pm(2 + 4i)$

D. $\pm(2 - 4i)$

Answer: A



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70. $\sqrt{-3 - 4i} =$

A. $\pm(1 + 3i)$

B. $\pm(1 - 3i)$

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

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

Answer: D



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71. $\sqrt{4ab - 2i(a^2 - b^2)} =$

A. $\pm \left\{ \frac{(a - b) + i(a + 2b)}{2} \right\}$

B. $\pm \{(i + 5b) + i(a - 4b)\}$

C. $\pm \{(a + 5b) + i(a - b)\}$

D. $\pm \{(i + b) + i(a - b)\}$

Answer: C

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72. If $z = 2 + 3i$, then $z\bar{z} =$

A. 13

B. -13

C. $\sqrt{13}$

D. $-\sqrt{13}$

Answer: A

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73. If $z = 3 + i$, then $(z + 1)(\bar{z} + 1) =$

A. 17

B. -17

C. $\sqrt{17}$

D. $-\sqrt{17}$

Answer: A



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74. If $z = 3 - 5i$ Show that $z^3 - 10z^2 + 58z - 136 = 0$

A. 0

B. 1

C. 2

D. 3

Answer: A



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75. If $x = -5 + 4i$ then $x^4 + 9x^3 + 35x^2 - x + 4 =$

A. -170

B. 160

C. 170

D. -160

Answer: D



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76. If $z = 3 + 5i$ then $z^3 + \bar{z} + 198 =$

A. $-3 - 5i$

B. $-3 + 5i$

C. $3 - 5i$

D. $3 + 5i$

Answer: D

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

A. 2

B. -2

C. 4

D. -4

Answer: B

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78. If the first term and common ratio of a G.P are both $(1/2)(\sqrt{3} + i)$, then the absolute value of its n^{th} term is

A. 2^n

B. 3^n

C. 1

D. none

Answer: C



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

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

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

C. $9+6i$

$$D. 9 - 6i$$

Answer: A



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80.

If

$$(a_1 + ib_1)(a_2 + ib_2)\dots(a_n + ib_n) = A + iB, \text{ then } \tan^{-1}\left(\frac{b_1}{a_1}\right) + \tan^{-1}\left(\frac{b_2}{a_2}\right) + \dots + \tan^{-1}\left(\frac{b_n}{a_n}\right) =$$

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

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

C. $n\pi + \tan^{-1}(A + B)$

D. none

Answer: B



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

A. $\theta = n\pi$

B. $\theta = n\pi/2$

C. $\theta = n\pi/3$

D. none

Answer: A



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82. If $\frac{1 - \sin \theta}{1 + 2i \sin \theta}$ is purely imaginary then $\theta =$

A. $n\pi \pm \frac{\pi}{3}, n \in \mathbb{Z}$

B. $n\pi + (-1) \frac{\pi}{2}, n \in \mathbb{Z}$

C. $n\pi \pm \frac{\pi}{4}, n \in \mathbb{Z}$

D. none

Answer: B

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83. If $\frac{3 + 2i \sin \theta}{3 - 2i \sin \theta}$ is real, then $\theta =$

A. π

B. $\pi/2$

C. $\pi/3$

D. $\pi/6$

Answer: A

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84. A value of θ for which $\frac{2 + 3i \sin \theta}{1 - 2i \sin \theta}$ is purely imaginary, is

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

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

C. $\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$

D. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: D



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85. If $\frac{\tan \alpha - i[\sin(\alpha/2) + \cos(\alpha/2)]}{1 + 2i \sin(\alpha/2)}$ is purely imaginary, is

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

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

C. $2n\pi \pm \frac{\pi}{4}$

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

Answer: A



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86. Find the general value of x if the expression $\frac{\sin \frac{x}{2} + \cos \frac{x}{2} + i \tan x}{1 + 2i \sin \frac{x}{2}}$ is real .

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

B. $2n\pi$ or $n\pi \frac{\pi}{4}$

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

D. none

Answer: B



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87. The principal value of the argument $-\sqrt{3} + i$ is

A. $2\pi / 3$

B. $5\pi / 6$

C. $\pi/6$

D. $-\pi/6$

Answer: B



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88. The amplitude of $1 + \cos \theta + i \sin \theta$ is

A. θ

B. $\theta/2$

C. $\theta/3$

D. none

Answer: B



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

A. $\pi/3$

B. $-\pi/3$

C. $\pi/6$

D. $-\pi/6$

Answer: C



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90. If $\pi/5$ and $\pi/3$ are the arguments of \bar{z}_1 and z_2 then the value of $\arg(z_1) + \arg(z_2)$ is

A. $6\pi/15$

B. $\pi/15$

C. $2\pi/15$

D. $4\pi / 15$

Answer: C



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91. If $\pi/3$ and $\pi/4$ are the arguments of z_1 and \bar{z}_2 then the value of $\arg(z_1 \cdot z_2)$

A. $5\pi / 12$

B. $\pi / 12$

C. $7\pi / 12$

D. $-\pi / 12$

Answer: B



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92. If $2\pi/3$ and $\pi/6$ are the arguments of \bar{z}_1 and z_2 then value of $\arg(z_1/z_2)$ is

A. $-5\pi/6$

B. $-\pi/6$

C. $5\pi/6$

D. $\pi/6$

Answer: A



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

A. 0

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

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

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

Answer: D



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94. If z_1 and z_2 are two non - zero complex numbers such that

$|z_1 + z_2| = |z_1| + |z_2|$ then $Argz_1 - Argz_2$ is

A. $-\pi$

B. $-\pi/2$

C. 0

D. $\pi/2$

Answer: C



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95. If z_1 and z_2 are two non - zero complex numbers such that

$|z_1 + z_2| = |z_1 - z_2|$, then $Argz_1 - Argz_2$ is

A. $-\pi$

B. $-\pi/2$

C. 0

D. $\pi/2$

Answer: D



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96. If z is a complex number of unit modulus and argument θ then, \arg

$\left(\frac{1+z}{1+z^{-1}}\right)$ equals:

A. θ

B. $\pi - \theta$

C. $-\theta$

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

Answer: A



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

Then $\arg z =$

A. $\pi/4$

B. $5\pi/4$

C. $3\pi/4$

D. $\pi/2$

Answer: C



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98. If z and ω are two nonzero complex numbers such that

$|z\omega| = 1$ and $\text{Arg}(z) - \text{Arg}(\omega) = \pi/2$ then $\text{Arg}(z\omega) =$

A. 1

B. -1

C. i

D. $-i$

Answer: D



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

(A,B) equals :

A. (1,0)

B. (-1,1)

C. (0,1)

D. (1,1)

Answer: D



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100. The polar form of $1 + \sqrt{3}i$ is

A. $2\left(\text{cis}\frac{\pi}{2}\right)$

B. $2\left(\text{cis}\frac{\pi}{3}\right)$

C. $2\left(\text{cis}\frac{\pi}{4}\right)$

D. none

Answer: B



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101. The mod -amplitude form of $\sqrt{3} - i$ is

A. $2\text{cis}\frac{5\pi}{6}$

B. $2\text{cis}\left(\frac{-\pi}{6}\right)$

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

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

Answer: B



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102. The mod -amplitude form of $-\sqrt{3} - i$ is

A. $2cis\left(\frac{5\pi}{6}\right)$

B. $2cis\left(\frac{-5\pi}{6}\right)$

C. $2cis\left(-\frac{\pi}{6}\right)$

D. $2cis\left(\frac{\pi}{6}\right)$

Answer: B



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103. The mod -amplitude form of $1 - \sqrt{3}i$

A. $2cis\left(\frac{2\pi}{3}\right)$

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

C. $2cis\left(\frac{-\pi}{3}\right)$

D. $2cis\left(\frac{\pi}{3}\right)$

Answer: C



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104. The mod -amplitude form of $5 + 12i$ is

A. $13cis\theta, \tan \theta = 12/5$

B. $13cis\theta, \sin \theta = 12/5$

C. $13cis\theta, \cos \theta = 12/5$

D. $13cis\theta, \cot \theta = 12/5$

Answer: A



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105. The mod -amplitude form of $\frac{1 + 7i}{(2 - i)^2}$ is

A. $\sqrt{2}cis \frac{3\pi}{4}$

B. $cis \left(\frac{\pi}{3} \right)$

C. $cis \left(\frac{-\pi}{3} \right)$

D. $cis \left(\frac{3\pi}{3} \right)$

Answer: A



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106. The mod -amplitude form of $1 + i \tan \theta$ is

A. $cis\theta \sec \theta$

B. $cis \frac{\theta}{2}$

C. $cis \left(\frac{\pi}{2} - \theta \right)$

D. $cis \left(\frac{\pi}{2} + \theta \right)$

Answer: A



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107. The mod -amplitude form of $1 + \cos \theta - i \sin \theta$ is

A. $2 \cos. \frac{\theta}{2} \cdot cis \left(- \frac{\theta}{2} \right)$

B. $2 \cos. \frac{\theta}{2} \cdot cis \left(\frac{\pi}{2} - \frac{\theta}{2} \right)$

C. $2 \cos. \theta \left(\frac{\pi}{2} + \theta \right)$

D. $\cos. \frac{\theta}{2} \cdot cis \left(- \frac{\theta}{2} \right)$

Answer: A



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108. The mod -amplitude form of $\sin \theta - i \cos \theta$ is

A. $cis \theta$

B. $\text{cis}\left(\frac{\pi}{2} + \frac{\theta}{2}\right)$

C. $\text{cis}\left(\frac{\pi}{2} + \theta\right)$

D. none

Answer: D



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109. If $\frac{\pi}{2} < \alpha < \frac{3\pi}{2}$, the mod argument of $1 + \cos 2\alpha + i \sin 2\alpha$ is

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

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

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

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

Answer: A



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110. If $(\cos 3\alpha + i \sin 3\alpha)(\cos 5\beta + i \sin 5\beta) = \cos \theta + i \sin \theta$ then θ is

A. $2\alpha + 3\beta$

B. $3\alpha + 6\beta$

C. $3\alpha + 5\beta$

D. $2\alpha + 4\beta$

Answer: C



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111. If $x + iy = cis \alpha$, then value of $x^2 + y^2$

A. 0

B. 1

C. -1

D. 2

Answer: B



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112. If $\text{cis}\alpha \cdot \text{cis}\beta \cdot \text{cis}\gamma = \text{cis}x$ then the value of x is

A. $\alpha + \beta + \gamma$

B. $\alpha + \beta - \gamma$

C. $\alpha - \beta + \gamma$

D. $\alpha - \beta - \gamma$

Answer: A



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113. If A, B, C are angles of a triangle such that $x = \text{cis}A, y = \text{cis}B, z = \text{cis}C$, then find the value of xyz .

A. 0

B. 1

C. -1

D. 2

Answer: C



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114. For any two complex numbers z_1, z_2 and real numbers a and b ,

$$|az_1 - bz_2|^2 + |bz_1 + az_2|^2 =$$

A. $(a^2 - b^2) (|z_1|^2 + |z_2|^2)$

B. $(a^2 + b^2) (|z_1|^2 + |z_2|^2)$

C. $(a^2 + b^2) (|z_1|^2 - |z_2|^2)$

D. None

Answer: B

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115. If $|z_1| = |z_2| = 1$, then $|z_1 + z_2| =$

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

B. $\left| \frac{1}{z_1} - \frac{1}{z_2} \right|$

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

D. none

Answer: A

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116. If $\frac{5z_2}{7z_1}$ is purely imaginary, then $\left| \frac{2z_1 + 3z_2}{2z_1 - 3z_2} \right| =$

A. $5/7$

B. $7/9$

C. $25/49$

D. 1

Answer: D



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$$117. \tan \left\{ i \log \left(\frac{a - ib}{a + ib} \right) \right\} =$$

A. ab

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

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

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

Answer: B



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118. If $|z - 4/z| = 2$ then the greatest value of $|z|$ is

A. $\sqrt{5}$

B. $\sqrt{5} + 1$

C. $\sqrt{5} - 1$

D. $1 - \sqrt{5}$

Answer: B



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119. The maximum value of $|z|$ when z satisfies the condition $|z+2/z|=2$ is

A. $\sqrt{3} - 1$

B. $\sqrt{3} + 1$

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

D. $\sqrt{3}$

Answer: B



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120. The minimum value of $|z - 1| + |z - 5|$ is

A. 5

B. 4

C. 3

D. 2

Answer: B



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121. If z_1, z_2 are two complex numbers satisfying

$$\left| \frac{z_1 - 3z_2}{3 - z_1\bar{z}_2} \right| = 1, |z_1| \neq 3 \text{ then } |z_2| =$$

A. 1

B. 2

C. 3

D. 4

Answer: A



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122. If the point $z = (1 + i)(1 + 2i)(1 + 3i) \dots (1 + 10i)$ lies on a circle with centre at origin and radius r , then $r^2 =$

A. $10!$

B. $2 \times 3 \times 4 \times \dots \times 10$

C. $2 \times 5 \times 10 \times \dots \times 101$

D. $11!$

Answer: C



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

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

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

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

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

Answer: D



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124. If $|3z-2|=5$ then the locus of z is

A. $9x^2 + 9y^2 + 12x - 21 = 0$

B. $9x^2 + 9y^2 - 12x - 21 = 0$

C. $9x^2 + 9y^2 + 12x + 21 = 0$

D. $9x^2 - 9y^2 + 12x - 21 = 0$

Answer: B



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125. If $|z-3+i| = 4$ then the locus of $z = x + iy$ is

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

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

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

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

Answer: A



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126. If $\left| \frac{z-1}{z-3} \right| = 2$ then the locus of $z = x + iy$ is

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

B. $x^2 + y^2 - 4x - 6y - 12 = 0$

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

D. $3x^2 + 3y^2 - 22x + 35 = 0$

Answer: D



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127. The locus of the point $z = x + iy$ satisfying the equation $\left| \frac{z - 1}{z + 1} \right| = 1$ is given by

A. $x = 0$

B. $y = 0$

C. $x = y$

D. $x + y = 0$

Answer: A



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128. If $\left| \frac{z - a}{z + a} \right| = 1$ where $\operatorname{Re}(a) \neq 0$ then locus of $z = x + iy$ is

A. $y = 0$

B. $x = 0$

C. $x^2 + y^2 + 2x - 4y = 0$ such that $y < 0$, $x^2 + y^2 > 1$

D. $x^2 + y^2 + 2x - 4y = 0$ such that $2x - y + 4 > 0$

Answer: B



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

A. $y = 0$

B. $y = 1$

C. $y = 2$

D. $y = 3$

Answer: A



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

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

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

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

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

Answer: B



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

A. x - axis

B. y - axis

C. $y = 2$

D. $x = 2$

Answer: A



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132. If $\left| \frac{z + 4i}{z - 2} \right| = 2$ then the locus of z is

A. a circle with centre 0

B. a real circle

C. an imaginary

D. none

Answer: B



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133. The complex number $z = x + iy$ which satisfy the equation

$$\left| \frac{z - 5i}{z + 5i} \right| = 1 \text{ lie on}$$

- A. x - axis
- B. $y = 5$
- C. circle passing through origin
- D. none

Answer: A



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134. The complex equation $|z+1-i|=|z+i-1|$ represents a

- A. Straight line
- B. circle
- C. parabola

D. Hyperbola

Answer: A



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135. The locus represented by $|z-1|=|z+i|$ is

- A. a circle of radius 1
- B. an ellipse with foci at $(1,0),(0,-1)$
- C. a straight line through the origin
- D. a circle on the line joining $(1,0),(0,1)$ as diameter

Answer: C



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136. If a is real number such that $|z-ai|=|z+ai|$, then the locus of z is

A. x - axis

B. y - axis

C. $x = y$

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

Answer: A



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137. In the Argand Diagrams , all the complex number z satisfying

$$|z - 4i| + |z + 4i| = 0 \text{ lie on a}$$

A. Straight line

B. circle

C. ellipse

D. parabola

Answer: A

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138. The locus of z satisfying $|z| + |z-1| = 3$ is

- A. a circle
- B. a pair of straight lines
- C. an ellipse
- D. a parabola

Answer: C

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139. If $\omega = \frac{z}{z - \frac{1}{3}i}$ and $|\omega| = 1$ then z lies on

- A. an ellipse
- B. a circle

C. a straight line

D. a parabola

Answer: C



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140. The locus of the point z in the argand plane for which

$$|z + 1|^2 + |z - 1|^2 = 4 \text{ is a}$$

A. Straight line

B. pair of straight lines

C. circle

D. parabola

Answer: C



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141. The locus of z such that $|z - 1|^2 + |z + 1|^2 = 4$ is a

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

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

C. $x^2 + 2y^2 = 2$

D. none

Answer: B



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

A. $4y = 0$

B. $4y = 2$

C. $4y = 3$

D. $4y = 4$

Answer: C



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143. If $z = x + iy$ is a complex number satisfying

$|z + i/2|^2 = |z - i/2|^2$ then the locus of z is

A. x - axis

B. y - axis

C. $y = x$

D. $2y = x$

Answer: A



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144. The points representing the complex numbers z for which

$|z + 4|^2 - |z - 4|^2 = 8$ lie on

- A. a straight line parallel to x - axis
- B. a straight line parallel to y - axis
- C. a circle with centre as origin
- D. a circle with centre other than the origin

Answer: B

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145. The locus of the point representing the complex number z for which

$$|z + 3|^2 - |z - 3|^2 = 15 \text{ is}$$

- A. a circle
- B. a parabola
- C. a straight line
- D. an ellipse

Answer: C

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146. If a complex number $|z^2 - 1| = |z|^2 + 1$, then z lies on :

- A. the real axis
- B. the imaginary axis
- C. $y = x$
- D. a circle

Answer: B

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

- A. a pair of straight lines
- B. a rectangular hyperbola
- C. a line

D. a set of four lines

Answer: A



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148. If $|z + \bar{z}| + |z - \bar{z}| = 2$, then z lies on

A. a straight lines

B. a square

C. a circle

D. none

Answer: A



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149. If a complex number $|z^2 - 1| = |z|^2 + 1$, then z lies on :

A. the real axis

B. an ellipse

C. a circle

D. the imaginary axis

Answer: D

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150. If $\text{amp}(z-i) = \pi/3$ then the locus of z is

A. $\sqrt{3}x - y + 1 = 0, x > 0, y > 1$

B. $\sqrt{3}x + y - 1 = 0,$

C. $\sqrt{3}x - y - 1 = 0,$

D. $\sqrt{3}x + y + 1 = 0,$

Answer: A

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151. If $\text{amp}(z - 3) = \pi/2$ then the locus of z is

A. $x = 0$

B. $x = 2n$

C. $x = 3$ such that $y > 0$

D. $x = 4$

Answer: C



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

A. $x + y - 1 = 0$

B. $x - y - 1 = 0$

C. $x + y + 1 = 0$

D. $x - y + 1 = 0$

Answer: D



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153. If $\text{Arg}(3z - 2i) = \pi/2$ then the locus of $z = x + iy$ is

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

B. $x = 0$ such that $y > 2/3$

C. $x^2 + y^2 + 2x - 4y = 0$ such that $y < 0, x^2 + y^2 > 1$

D. $x^2 + y^2 + 2x - 4y = 0$ such that $2x - y + 4 = 0$

Answer: B



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154. If $\text{Arg}\left(\frac{z+1}{z-1}\right) = \frac{\pi}{6}$ then the locus of $z = x + iy$ is

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

B. $x = 0$ such that $y > 2/3$

C. $x^2 + y^2 + 2\sqrt{3}y - 1 = 0$ such that $x < 0, x^2 + y^2 > 1$

D. $x^2 + y^2 + 2x - 4y = 0$ such that $2x - y + 4 > 0$

Answer: C

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

A. a circle

B. a straight line

C. a parabola

D. an ellipse

Answer: A

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156. If $\text{Amp} \left(\frac{z + 2}{z - 4i} \right) = \frac{\pi}{2}$ then the locus of $z = x + iy$ is .

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

B. $x = 0$ such that $y > 2/3$

C. $x^2 + y^2 + 2x - 4y = 0$ such that $y > 0, x^2 + y^2 > 1$

D. $x^2 + y^2 + 2x - 4y = 0$ such that $2x - y + 4 > 0$

Answer: D



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

A. circle

B. pair of lines

C. parabola

D. hyperbola

Answer: A

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158. If $\operatorname{Re} \left(\frac{z + 3}{z - 2i} \right) = 0$ then the locus of $z = x + iy$ is

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

B. $x^2 + y^2 - 4x - 6y - 12 = 0$

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

D. $3x^2 + 3y^2 - 22x - 35 = 0$

Answer: C

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159. If $\text{Im} \left(\frac{z-1}{z+1} \right) = 0$ then the locus of $z = x + iy$ is

A. $y = 0$

B. $y = 2$

C. $y = 3$

D. $y = 4$

Answer: A



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160. If $\text{Re} (z^2) = 2$ then the locus of z is

A. $xy = 1, x^2 - y^2 = 0$

B. $xy = 0, x^2 - y^2 = 2$

C. $xy = 0, x^2 - y^2 = 1$

D. $xy = 2, x^2 - y^2 = 0$

Answer: B



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161. If $z(\bar{z} + 3) = 2$ then the locus of $z = x + iy$ is

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

B. $x = 0$ such that $y > 2/3$

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

D. $x^2 + y^2 + 2x - 4y = 0$ such that $2x - y + 4 > 0$

Answer: A



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162. If $z\bar{z} = 4$ then the locus of z is

A. $x^2 + y^2 = 4$

B. $x^2 + y^2 = 2$

C. $x^2 - y^2 = 2$

D. $x^2 + y^2 = 3$

Answer: A



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163. If $\frac{z - i}{z + 1}$ is purely imaginary then the locus of $z = x + iy$ is

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

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

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

D. none

Answer: C



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164. If $\frac{z+2}{z+6i}$ is purely real then the locus of $z = x + iy$ is

A. $3x + y + 6 = 0$

B. $3x + y - 6 = 0$

C. $3x - y - 6 = 0$

D. none

Answer: A



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165. It $z \neq 1$ and $\frac{z^2}{z-1}$ is real, then point represent by the complex number z lies

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

B. on the imaginary axis

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

D. on a circle with centre at the origin

Answer: C



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166. A complex number z is said to be unimodular if $|z|=1$, Suppose z_1 and z_2 are complex numbers such that $\frac{z_1 - 2z_2}{2 - z_1z_2}$ is unimodular and z_2 is not unimodular . Then the point z_1 lies on a

- A. Straight line parallel to x - axis
- B. Straight line parallel to y - axis
- C. Circle of radius 2
- D. Circle of radius $\sqrt{2}$

Answer: C



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167. If $z = (\lambda + 3) + i\sqrt{5 - \lambda^2}$ then the locus of z is a circle with centre at

A. (0,0)

B. (0,3)

C. (3,0)

D. (-3,0)

Answer: C



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

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

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

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

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

Answer: A



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169. If $|z - 1| > 2|z - 2|$ then the locus of $z = x + iy$ is

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

B. $3x^2 + 3y^2 - 14x + 15 > 0$

C. $3x^2 + 3y^2 - 14x + 15 < 0$

D. $3x^2 + 3y^2 - 14x + 15 = 0$

Answer: B



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170. The region represented by $|z + a| + |z - a| < 4a$ is

A. $x^2 + y^2 < 4a^2$

B. $x^2 + y^2 > 4a^2$

C. $x^2 - y^2 < 4a^2$

D. none

Answer: D

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171. The region of the argand plane defined by $|z - i| + |z + i| \leq 4$ is

A. interior of an ellipse

B. exterior of a circle

C. interior and boundary of a ellipse

D. none

Answer: C

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

is :

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

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

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

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

Answer: A



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173. The locus of z satisfying the inequality $\log_{1/3}|z + 1| > \log_{1/3}|z - 1|$

A. $Re(z) > 0$

B. $Re(z) < 0$

C. $Im(z) > 0$

D. $\text{Im}(z) < 0$

Answer: B



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

A. $|z| < 3/2$

B. $|z| > 3/2$

C. $|z| > 2$

D. $|z| < 2$

Answer: C



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

A. $\operatorname{Re}(z) > 3$

B. $\operatorname{Re}(z) < 3$

C. $\operatorname{Im}(z) > 3$

D. $\operatorname{Im}(z) < 3$

Answer: A



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176. If $\left|z - \frac{4}{z}\right| = 2$, then the maximum value $|z|$ is equal to

A. $\sqrt{5} + 1$

B. 2

C. $2 + \sqrt{2}$

D. $\sqrt{3} + 1$

Answer: A



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

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

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

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

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

Answer: D



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

A. 0

B. 1

C. 2

D. ∞

Answer: B



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

A. 1

B. 2

C. 3

D. 5

Answer: D



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180. The triangle formed by the points 1 , $\frac{1+i}{\sqrt{2}}$ and i as vertices in the Argand diagram is

- A. scalene
- B. equilateral
- C. isosceles
- D. right angled

Answer: C



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181. If $z_1 = 1 + 2i$, $z_2 = 2 + 3i$, $z_3 = 3 + 4i$, then z_1 , z_2 and z_3 represents the vertices of

- A. equilateral triangle
- B. right angled triangle
- C. isosceles triangle

D. none

Answer: C



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182. In the Argand plane, the points represented by the complex numbers $1 + 2i$, $2 + 3i$ and $-4 - 3i$ form

A. collinear

B. right angled triangle

C. equilateral triangle

D. none

Answer: A



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183. In the Argand plane, the points represented by the complex numbers $2 - i$, $-4 + 3i$ and $-3 - 2i$ form

- A. right angled triangle
- B. equilateral triangle
- C. isosceles triangle
- D. right isosceles triangle

Answer: D



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184. Area of the triangle formed by the three complex numbers, $1 + i$, $1 - i$, $2i$ in the Argand diagram is

- A. $1/2$
- B. 1
- C. $\sqrt{2}$

D. 2

Answer: B



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185. Area of the triangle formed by the Argand diagram formed by the complex numbers z , iz and $z + iz$ is

A. $|z|^2$

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

C. $|z|$

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

Answer: B



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186. If $|z| = 3$, then area of the triangle whose sides are z , ωz and $z + \omega z$ (where ω is a complex cube root of unity) is

A. $\frac{9\sqrt{3}}{4}$

B. $\frac{8\sqrt{3}}{4}$

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

D. $\frac{8\sqrt{3}}{3}$

Answer: A



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187. If the area of the triangle on the complex plane formed the points z , iz and $z + iz$ is 50 square units, then $|z|$ is

A. 5

B. 10

C. 15

D. none

Answer: B

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188. If a and b are real number between 0 and 1 such that the points $z_1 = a + I$, $z_2 = 1 + bi$ and $z_3 = 0$ form an equilateral triangle then a , b , are

A. $2 - \sqrt{3}, 2 - \sqrt{3}$

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

C. $2 + \sqrt{3}, 2 - \sqrt{3}$

D. none

Answer: A

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

A. $a^2 = b$

B. $a^2 = 2b$

C. $a^2 = 3b$

D. $a^2 = 4b$

Answer: C



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190. If z_1, z_2, z_3 are the vertices of a triangle then its centroid is

A. $z_1 + z_2 + z_3$

B. $\frac{z_1 + z_2 + z_3}{3}$

C. $3(z_1 + z_2 + z_3)$

D. none

Answer: B

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191. Let the complex number z_1, z_2, z_3 be the vertices of an equilateral triangle . Let z_0 be the circumcentre of the triangle . Then

$$z_1^2 + z_2^2 + z_3^2 =$$

A. $2z_0^2$

B. $3z_0^2$

C. $4z_0^2$

D. $4z_0^2$

Answer: B

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192. ABC is an isosceles triangle and $B=90^\circ$. If B and the midpoint P of AC are represented by $3+2i$ and $1-i$ then other vertices are

A. $4+i, -2-3i$

B. $4-3i, -2+i$

C. $4-i, -2-i$

D. none

Answer: B



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193. If three complex number are in A.P then they lie on

A. a straight line

B. a circle

C. a parabola

D. none

Answer: A



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194. If the Argand plane, the points represented by the complex numbers $7-4i, -3+8i, -2-6i$ and $18i$ form

A. parallelogram

B. rectangle

C. rhombus

D. square

Answer: A



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195. In the Argand plane, the points represented by the complex numbers $2 - 6i, 4 - 7i, 3 - 5i$ and $1 - 4i$ form

A. parallelogram

B. rectangle

C. rhombus

D. square

Answer: C



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196. The condition for the points z_1, z_2, z_3, z_4 taken in order in the Argand plane to be the vertices of a parallelogram is

A. $z_1 + z_2 = z_3 + z_4$

B. $z_1 + z_3 = z_2 + z_4$

C. $z_1 + z_2 = z_3 + z_4 = 0$

D. none

Answer: B

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197. The straight line joining the points in Argand diagram given by $0 + 0i$ and $7 + 7i$ in the Argand plane is

A. $y = x$

B. $y = 7$

C. $x = 7$

D. $y = 0$

Answer: A

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198. The equation of the line joining the points represented by $2 - 3i$ and $-3 + 4i$ in the Argand plane is

A. $7x - 5y - 1 = 0$

B. $7x + 5y - 1 = 0$

C. $7x + 5y + 1 = 0$

D. $7x - 5y + 1 = 0$

Answer: C



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199. The equation of the perpendicular bisector of the line joining the points $3 + 3i$ and $3 - 3i$ in the Argand plane.

A. $y = 0$

B. $y = 1$

C. $y = 2$

D. $y = 3$

Answer: A



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200. If a is a complex number and b is a real number then the equation

$$\bar{a}z + a\bar{z} + b = 0$$
 represents

- A. Straight line
- B. Parabola
- C. Circle
- D. Hyperbola

Answer: A



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201. Let α, β be real and z be a complex number. If $z^2 + \alpha z + \beta = 0$ has

two distinct roots on the line $\operatorname{Re} z = 1$, then it is necessary that :

- A. $|\beta| = 1$
- B. $\beta \in (1, \infty)$

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

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

Answer: B



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Exercise 2 Special Type Questions Set 1

I: $i^2 + i^4 + i^6 + \dots (2n + 1) \text{ terms} = -1$

II: $1 + i^2 + i^4 + i^6 + \dots i^{2n} = 0$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: A



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2. I : The additive inverse of $i - 2$ is $2 - i$

II : The multiplicative inverse of $1 - I$ is $1 + i$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: A



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3. The least positive integral value of n for which $\left(\frac{1 - i}{1 + i}\right)^{2n} = 1$ is

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: C



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4. I: If z_1 and z_2 are two nonzero complex numbers such that

$|z_1 + z_2| = |z_1| + |z_2|$ then $\arg z_1 - \arg z_2$ is $\pi/2$

II : If z_1 and z_2 are two complex numbers such that

$|z_1 z_2| = 1$ and $\arg z_1 - \arg z_2 = \pi/2$ then $\bar{z}_1 \bar{z}_2 = -i$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: B



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5. I : If $z = \bar{z}$ then z is purely imaginary

II: If $|z_1 + z_2| = |z_1| + |z_2|$ then $\arg z_1 - \arg z_2$ is $\pi/2$

II: If z_1 and z_2 are two complex numbers such that

$|z_1 z_2| = 1$ and $\arg z_1 - \arg z_2 = \pi/2$ then $\bar{z}_1, \bar{z}_2 - i$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: C



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6. If α, β are roots of $x^2 + px + q = 0$ and ω is a cube root of unity then

I: $(\omega\alpha + \omega^2\beta)(\omega^2\alpha + \omega\beta) = p^2 - 3q$ II: $(\omega\alpha - \omega^2\beta)(\omega^2\alpha - \omega\beta) = p^2$

$$\text{III: } (\alpha + \omega\beta)(\alpha + \omega^2\beta) = p^2 - 3q$$

- A. only I , II is true
- B. only II , III is true
- C. both I , III are true
- D. all I,II , III are true

Answer: D



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Exercise 2 Special Type Questions Set 2

1. The ascending order of the moduli of the complex numbers

$$z_1 = 1 + I, z_2 = 1 + 2i, z_3 = \frac{1 - i}{\sqrt{2}}, z_4 = 3 + 4i \text{ is}$$

- A. z_1, z_2, z_3, z_4
- B. z_4, z_2, z_1, z_3

C. z_3, z_1, z_2, z_4

D. z_4, z_3, z_2, z_1

Answer: C



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2. Arrange the following values in descending order

A) $(1 + \omega)(1 + \omega^2)(1 + \omega^4)(1 + \omega^8)$ B)

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

C) $(1 - \omega)(1 - \omega^2)(1 - \omega^4)(1 - \omega^8)$ D) $(1 - \omega + \omega^2)(1 - \omega^2 + \omega^4)$

A. A,C,D,B

B. B,D,C,A

C. B,C,D,A

D. B,A,D,C

Answer: C



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3.

If

$$|z_1| = 1, |z_2| = 1 \text{ and } A = \text{Arg}(z_1, z_2), B = \text{Arg}(z_1/z_2), C = \text{Arg}(z_1 + z_2)$$

arrange A,B,C,D in ascending order

A. A,C,D,B

B. B,D,C,A

C. B,C,D,A

D. B,A,D,C

Answer: B



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4. For a complex number z

A) Minimum value of $|z|+|z-2|$ B) Minimum value of $|z-1|+|z-2|$

C) Minimum value of $|z-2|+|z-6|$ D) Minimum value of $|z-1|+|z-4|$

Arrange the above values in ascending order

A. B,A,D,C

B. C,D,A,B

C. A,B,D,C

D. B,A,C,D

Answer: A



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

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

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

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

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

Answer: C



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

A. $m_1 < m_2 < m_3 < m_4$

B. $m_4 < m_3 < m_2 < m_1$

C. $m_3 < m_2 < m_4 < m_1$

D. $m_3 < m_1 < m_2 < m_4$

Answer: C



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Exercise 2 Special Type Questions Set 3

1. Match the following

$$I. \quad (1 - i)(1 + 2i)(1 - 3i) = \quad \text{a) } 6 - 8i$$

$$II. \quad (1 - i)^6 + (1 - i)^3 = \quad \text{b) } -2i$$

$$III. \quad \left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1+i}{1+i}\right)^3 = \quad \text{c) } -2 - 10i$$

$$IV. \quad \sqrt{-5 + 12i} = \quad \text{d) } 2 + 3i$$

A. a,c,b,d

B. b,d,c,a

C. d,b,a,c

D. c,a,b,d

Answer: A



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2. If $x = a + b$, $y = a\omega + b\omega^2$, $z = a\omega^2 + b\omega$ then match the following

- I. $x + y + z$ a) $a^3 + b^3$
II. xyz b) $3(a^3 + b^3)$
III. $x^2 + y^2 + z^2$ c) $6ab$
IV. $x^3 + y^3 + z^3$ d) 0
 e) $2(a^3 + b^3)$

A. d,b,a,e

B. d,e,b,c

C. d,a,c,d

D. d,a,e,b

Answer: C



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3. Match the following

	Complex number	Polar form
I.	$1 + \sqrt{3}i$	a) $2cis(\pi/3)$
II.	$1 - \sqrt{3}i$	b) $2cis(-2\pi/3)$
III.	$-1 + \sqrt{3}i$	c) $2cis(2\pi/3)$
IV.	$-1 - \sqrt{3}i$	d) $2cis(-\pi/3)$

A. a,c,b,d

B. b,d,c,a

C. a,d,c,b

D. c,a,b,d

Answer: C



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4. Match the following

I.	If $ z-3+i =4$ then the locus of z is	a) $x^2 + y^2 - 6x + 2$
II.	If $ z-1 =2 z-3 $ then the locus of z is	b) $3x^2 + 3y^2 - 22x$
III.	If $ z-i = z+i $ then the locus of z is	c) $y = 0$
IV.	If $ z-1 ^2 + z+1 ^2 = 4$ then the locus of z is	d) $x^2 + y^2 = 1$

A. a,c,b,d

B. b,d,c,a

C. a,d,c,b

D. a,b,c,d

Answer: D



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5. If $z = 1 + i\sqrt{3}$ then match the following

I $Arg(z)$ a) $5\pi/6$

II. $Arg(iz)$ b) $-\pi/3$

III. $Arg(\bar{z})$ c) π

IV. $Arg(i\bar{z})$ d) $\pi/6$

e) $\pi/3$

A. e,a,b,c

B. e,b,a,c

C. e,b,a,d

D. e,a,b,d

Answer: D



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6. If $a = \frac{1 - i\sqrt{3}}{2}$ then the correct matching of List - I from List - II is

List - I

List - II

i) $a\bar{a}$

A) $2\pi/3$

ii) $\arg(1/\bar{a})$

B) $-i/\sqrt{3}$

iii) $a - \bar{a}$

D) 1

iv) $\operatorname{Im}(4/3a)$

E) $\pi/3$

F) $2\sqrt{3}$

Correct match is

A. (i) (ii) (iii) (iv)

D E C B

B. (i) (ii) (iii) (iv)

D A B F

C. (i) (ii) (iii) (iv)

F E B C

D. (i) (ii) (iii) (iv)

D A B C

Answer: B



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Exercise 2 Special Type Questions Set 4

1. A : If argument of $z_1 = \pi/3$, argument of $z_2 = \pi/4$ then argument of $z_1 z_2$ is $7\pi/12$

R : $\text{Arg}(z_1 z_2) = \text{Arg}z_1 + \text{Arg}z_2$

- A. A is true , R is true and R correct explanation of A
- B. A is true , R is true and R is not correct explanation of A
- C. A is true , R is false
- D. A is false, R is true

Answer: A



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2. (A) : The mod amplitude form of $\frac{1 + 7i}{(2 - i)^2}$ is $\sqrt{2}$ c is $\frac{3\pi}{4}$

(R) : The mod-amplitude form $z = a + ib$ is $r \text{ cis } \theta$ where $r = |z|$, θ is

amplitude of z

- A. A is true , R is true and R correct explanation of A
- B. A is true , R is true and R is not correct explanation of A
- C. A is true , R is false
- D. A is false, R is true

Answer: A



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3. A : If $2z_1 - 3z_2 + z_3 = 0$ then z_1, z_2, z_3 are collinear points

R : If $a, b, c \in \mathbb{R}$ such that $a + b + c = 0$ and

$az_1 + bz_2 + cz_3 = 0$ then z_1, z_2, z_3 are collinear

- A. A is true , R is true and R correct explanation of A
- B. A is true , R is true and R is not correct explanation of A
- C. A is true , R is false

D. A is false, R is true

Answer: A



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4. A : If $|z+1| - |z-1| = 3/2$ then the least value of $|z|$ is $3/4$

R : If z_1, z_2 are two complex numbers then $|z_1 - z_2| \geq ||z_1| - |z_2||$

A. A is true , R is true and R correct explanation of A

B. A is true , R is true and R is not correct explanation of A

C. A is true , R is false

D. A is false, R is true

Answer: B



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5. A : Area of triangle formed by $1 + i$, $-1 + I$, $2i$ is '1' square unit

R : Area of triangle formed by the complex number z , iz , $z + iz$ is $\frac{1}{2}|z|^2$

A. A is true , R is true and R correct explanation of A

B. A is true , R is true and R is not correct explanation of A

C. A is true , R is false

D. A is false, R is true

Answer: A



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