MULTIPLE CHOICE QUESTIONS

Type I : Problems on Basic Definition :

1. Polar form of the complex number $z = x + iy$ is (1)
   (A) $r(\cos\theta + i\sin\theta)$ (B) $r(\cos\theta - i\sin\theta)$
   (C) $(\cos\theta - i\sin\theta)$ (D) $(\cos\theta + i\sin\theta)$

2. Exponential form of the complex number $z = x + iy$ is (1)
   (A) $r\,e^{i\theta}$ (B) $e^{i\theta}$
   (C) $r\,e^{\theta}$ (D) none of these

3. Modulus of the complex number $z = x + iy$ is (1)
   (A) $\sqrt{x^2 - y^2}$ (B) $\tan^{-1}\frac{y}{x}$
   (C) $\sqrt{x^2 + y^2}$ (D) none of these

4. Argument of the complex number $z = x + iy$ for $x > 0, y > 0$ is (1)
   (A) $\tan^{-1}\frac{y}{x}$ (B) $\tan^{-1}\frac{x}{y}$
   (C) $\sqrt{x^2 + y^2}$ (D) $\sqrt{x^2 - y^2}$

5. If $z = x + iy$ is the complex number then its complex conjugate $\bar{z}$ is equal to (1)
   (A) $x - iy$ (B) $-x + iy$
   (C) $-x - iy$ (D) none of these

6. On Argand's diagram, complex number $z = x + iy$ represents (1)
   (A) point on xoy-plane (B) line on xoy-plane
   (C) circle on xoy-plane (D) none of these

7. Two complex numbers z_1 and z_2 are comparable if (1
   (A) z_1 and z_2 are real numbers
   (B) z_1 and z_2 are complex numbers
   (C) z_1 is complex number and z_2 is real number
   (D) z_1 is real number and z_2 is complex number

8. If $z = 1 + i$ then arg (z) is equal to (1)
   (A) $\frac{\pi}{4}$ (B) $\pi + \frac{\pi}{4}$
   (C) $\pi - \frac{\pi}{4}$ (D) π

9. If $z = -1 + i$ then arg (z) is equal to (1)

(a) $\frac{\pi}{4}$ (B) $\pi + \frac{\pi}{4}$

(C) $\pi - \frac{\pi}{4}$ (D) π

10. If $z = -1 - i$ then arg (z) is equal to (1)

(A) $\frac{\pi}{4}$ (B) $\pi + \frac{\pi}{4}$

(C) $\pi - \frac{\pi}{4}$ (D) $\frac{\pi}{2}$

11. If $z = 1 - i$ then arg (z) is equal to (1)

(A) $-\frac{\pi}{4}$ (B) $\pi + \frac{\pi}{4}$

(C) $\pi - \frac{\pi}{4}$ (D) π

12. For any complex numbers z_1, z_2 arg $(z_1 \times z_2)$ is equal to (1)

(A) arg $z_1 \times$ arg z_2 (B) arg z_1 + arg z_2

(C) arg z_1 – arg z_2 (D) $\frac{\arg z_1}{\arg z_2}$

13. For any complex numbers z_1, z_2 the modulus of product $|z_1 \times z_2|$ is equal to (1)

(A) $|z_1| \times |z_2|$ (B) $|z_1| - |z_2|$

(C) $\frac{|z_1|}{|z_2|}$ (D) none of these

14. For any complex numbers z_1, z_2, arg $\left(\frac{z_1}{z_2}\right)$ is equal to (1)

(A) arg $z_1 \times$ arg z_2 (B) arg z_1 + arg z_2

(C) arg z_1 – arg z_2 (D) $\frac{\arg z_1}{\arg z_2}$

15. For any complex numbers z_1, z_2 the modulus of $\left|\frac{z_1}{z_2}\right|$ is equal to

(A) $\frac{|z_2|}{|z_1|}$ (B) $|z_1| - |z_2|$

(C) $\frac{|z_1|}{|z_2|}$ (D) $|z_1| \times |z_2|$

16. Real part of the complex number $z = e^{5 + i\frac{\pi}{2}}$ is

(A) e^5 (B) $-e^5$

(C) 0 (D) e^{-5}

17. Imaginary part of the complex number $z = e^{(5+3i)^2}$ is (2)

(A) $e^{34} \sin 30$ (B) $e^{34} \cos 30$

(C) $e^{16} \cos 30$ (D) $e^{16} \sin 30$

18. x + iy form of the complex number $z = \dfrac{1}{(2+i)^2}$ is (2)

(A) $\dfrac{1}{25}(3+4i)$ (B) $\dfrac{1}{25}(3-4i)$

(C) $(2+i)^{-2}$ (D) $\dfrac{1}{25}(-3-4i)$

19. x + iy form of the complex number $z = \dfrac{1+i}{(1-i)^2}$ is (2)

(A) $\dfrac{1}{2}(1-i)$ (B) $\dfrac{1}{2}(-1+i)$

(C) $\dfrac{1}{2}(1+i)$ (D) $\dfrac{1}{2}(-1-i)$

20. x + iy form of the complex number $z = \dfrac{2+i6\sqrt{3}}{5+i\sqrt{3}}$ is (2)

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

(C) $(-1-i\sqrt{3})$ (D) $6+i5\sqrt{3}$

21. Polar form of the complex number $\dfrac{1}{2} + i\dfrac{\sqrt{3}}{2}$ is (2)

(A) $\cos\dfrac{\pi}{3} + i \sin\dfrac{\pi}{3}$ (B) $\cos\dfrac{\pi}{3} - i \sin\dfrac{\pi}{3}$

(C) $\dfrac{1}{2}\left(\cos\dfrac{\pi}{3} + i \sin\dfrac{\pi}{3}\right)$ (D) $\dfrac{1}{2}\left(\cos\dfrac{\pi}{3} - i \sin\dfrac{\pi}{3}\right)$

22. If z = x + iy then value of $\dfrac{z}{\bar{z}} + \dfrac{\bar{z}}{z}$ is equal to (2)

(A) $2\left(\dfrac{x^2+y^2}{x^2-y^2}\right)$ (B) $\left(\dfrac{x^2+y^2}{x^2-y^2}\right)$

(C) $2\left(\dfrac{x^2-y^2}{x^2+y^2}\right)$ (D) $\left(\dfrac{x^2-y^2}{x^2+y^2}\right)$

23. The smallest positive integer n for which $\left(\dfrac{1+i}{1-i}\right)^n = 1$ is (2)

(A) $n = 1$ (B) $n = \dfrac{1}{4}$

(C) $n = 4$ (D) $n = 2$

24. The smallest positive integer n for which $(1+i)^{2n} = (1-i)^{2n}$ is

(A) $n = 4$ (B) $n = 8$

(C) $n = 12$ (D) $n = 2$

25. If $z = a\cos\theta + ia\sin\theta$ then $\frac{z}{\bar{z}} + \frac{\bar{z}}{z}$ is equal to

(A) $2\sin 2\theta$ (B) $2\cos 2\theta$

(C) $2\tan 2\theta$ (D) $2\cot 2\theta$

26. If $(1 + ai)(1 + bi) = z$ then arg (z) is equal to

(A) $\tan^{-1}\left(\frac{a+b}{1-ab}\right)$ (B) $\tan^{-1}\left(\frac{1-ab}{a+b}\right)$

(C) $\sin^{-1}\left(\frac{a+b}{1-ab}\right)$ (D) $\cos^{-1}\left(\frac{a+b}{1-ab}\right)$

27. If $(a_1 + ib_1)(a_2 + ib_2) = A + iB$ then which of the following is true ?

(A) $\tan^{-1}\left(\frac{b_1}{a_1}\right) + \tan^{-1}\left(\frac{b_2}{a_2}\right) = \tan^{-1}\left(\frac{B}{A}\right)$ (B) $\tan^{-1}\left(\frac{b_1}{a_1}\right) - \tan^{-1}\left(\frac{b_2}{a_2}\right) = \tan^{-1}\left(\frac{B}{A}\right)$

(C) $\tan^{-1}\left(\frac{a_1}{b_1}\right) + \tan^{-1}\left(\frac{a_2}{b_2}\right) = \tan^{-1}\left(\frac{A}{B}\right)$ (D) none of these

28. If $|z_1 + z_2|^2 = r_1^2 + r_2^2 + 2r_1r_2\cos(\theta_1 - \theta_2)$, $|z_1 - z_2|^2 = r_1^2 + r_2^2 - 2r_1r_2\cos(\theta_1 - \theta_2)$ and $|z_1 + z_2|^2 = |z_1 - z_2|^2$ then

(A) $\theta_1 + \theta_2 = \frac{\pi}{2}$ (B) $\theta_1 - \theta_2 = 0$

(C) $\theta_1 - \theta_2 = \frac{\pi}{2}$ (D) none of these

29. If $(\alpha + i\beta) = \frac{1}{(a+ib)}$ then which of the following is correct ?

(A) $(\alpha^2 - \beta^2)(a^2 - b^2) = 1$ (B) $(\alpha^2 + \beta^2)(a^2 + b^2) = 1$

(C) $\frac{(\alpha^2 + \beta^2)}{(a^2 + b^2)} = 1$ (D) none of these

30. If z is a complex number such that if $|z| = 4$ and arg $(z) = \frac{\pi}{3}$ then z is equal to

(A) $4\left(\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)$ (B) $4\left(\frac{1}{2} - i\frac{\sqrt{3}}{2}\right)$

(C) $4\left(\frac{\sqrt{3}}{2} + i\frac{1}{2}\right)$ (D) none of these

31. If $\alpha - i\beta = \frac{1}{a - ib}$ then which of the following is correct ? (2)

(A) $(\alpha^2 - \beta^2)(a^2 - b^2) = 1$
(B) $(\alpha^2 + \beta^2)(a^2 + b^2) = 1$
(C) $\frac{(\alpha^2 + \beta^2)}{(a^2 + b^2)} = 1$
(D) none of these

Type II : Problems on Argand's Diagram :

32. Locus of z satisfying $\arg(z) = \frac{\pi}{3}$ is (2)

(A) straight line $y = \sqrt{3}\,x$
(B) straight line $y = -\sqrt{3}\,x$
(C) straight line $y = \frac{1}{\sqrt{3}}\,x$
(D) straight line $y = -x$

33. Locus of z satisfying $|z + 1| = |z - i|$ is (2)

(A) circle $(x - 1)^2 + (y + 1)^2 = 2$
(B) parabola $y^2 = x$
(C) straight line $y = + x$
(D) straight line $y = -x$

34. Locus of z satisfying $\mathrm{Re}(z^2) = 1$ is (2)

(A) circle $(x - 1)^2 + (y + 1)^2 = 2$
(B) hyperbola $x^2 - y^2 = 1$
(C) ellipse $\frac{x^2}{1} + \frac{y^2}{2} = 1$
(D) straight line $y = -x$

35. If z is a complex number for which $\frac{z + i}{z + 2}$ is purely real, then the locus of z is (2)

(A) circle $x^2 + y^2 + x + y = 0$
(B) hyperbola $x^2 - y^2 = 1$
(C) ellipse $\frac{x^2}{1} + \frac{y^2}{2} = 1$
(D) straight line $x + 2y + 2 = 0$

36. If z is a complex number for which $\frac{z + i}{z + 2}$ is purely imaginary, then the locus of z is (2)

(A) circle $x^2 + y^2 + 2x + y = 0$
(B) hyperbola $x^2 - y^2 = 1$
(C) ellipse $\frac{x^2}{1} + \frac{y^2}{2} = 1$
(D) straight line $x + 2y + 2 = 0$

37. If $z(z + i)$ is purely real number then the locus of z is (2)

(A) $x = 0$ or $y = -\frac{1}{2}$
(B) $x \neq 0$ and $y \neq -\frac{1}{2}$
(C) $x = -\frac{1}{2}$ or $y = 0$
(D) $x \neq 0$ and $y \neq 0$

38. If $\bar{z}(z + i)$ is purely imaginary number then locus of z is (2)

(A) $x^2 + y^2 + y = 0$
(B) $x^2 - y^2 - y = 0$
(C) $x = 0$
(D) none of these

39. By rotating vector $\overline{OA}$ in anticlockwise direction through an angle $\frac{\pi}{3}$, we get

(A) $\overline{OB} = \overline{OA}\, e^{i\frac{\pi}{3}}$
(B) $\overline{OB} = \overline{OA}\, e^{-i\frac{\pi}{3}}$
(C) $\overline{OB} = \overline{OA}\, e^{\frac{\pi}{3}}$
(D) none of these

40. By rotating vector OA = 2 – i in anticlockwise through angle $\frac{\pi}{3}$, we get

(A) $\left(1+\frac{\sqrt{3}}{2}\right)+i\left(\sqrt{3}-\frac{1}{2}\right)$
(B) $\left(1+\frac{\sqrt{3}}{2}\right)-i\left(\sqrt{3}-\frac{1}{2}\right)$
(C) $\left(1-\frac{\sqrt{3}}{2}\right)+i\left(\sqrt{3}-\frac{1}{2}\right)$
(D) $\left(1-\frac{\sqrt{3}}{2}\right)-i\left(\sqrt{3}+\frac{1}{2}\right)$

41. By rotating vector OA = 5 + 6i in anticlockwise direction through an angle $\frac{\pi}{2}$ we get

(A) 5 – 6i
(B) 5i + 6
(C) 5i – 6
(D) 5 + 6i

42. Locus of z satisfying $|z-2| = 3$ is

(A) straight line passing through (2, 0) and (3, 0)
(B) circle with centre (2, 0) and radius 3
(C) circle with centre (2, 0) and radius $\sqrt{3}$
(D) circle with centre (–2, 0) and radius 3

43. Locus of z satisfying $|z-i| = 6$ is

(A) straight line passing through (0, 1) and (6, 0)
(B) circle with centre (0, 1) and radius $\sqrt{6}$
(C) circle with centre (1, 0) and radius 6
(D) circle with centre (0, 1) and radius 6

44. Locus of z satisfying $|z+2-i| = 2$ is

(A) $(x+2)^2 + (y-1)^2 = 4$
(B) $(x-2)^2 + (y+1)^2 = 4$
(C) $(x+2)^2 + (y-1)^2 = 2$
(D) $(x-2)^2 + (y+1)^2 = 2$

45. Locus of z satisfying $|z-3| + |z+3| = 10$ is

(A) ellipse
(B) circle
(C) hyperbola
(D) parabola

46. Locus of z satisfying $|z-2i| + |z+2i| = 5$ is the ellipse with major axis along

(A) x-axis
(B) y-axis
(C) y = x
(D) y = –x

47. Locus of z satisfying $|z-3|+|z+3|=10$ is the ellipse with major axis along (2)

(A) x-axis (B) y-axis

(C) $y=x$ (D) $y=-x$

48. The complex number $\left(\frac{1+2i}{1-i}\right)$ lies in the (2)

(A) first quadrant (B) second quadrant

(C) third quadrant (D) fourth quadrant

Type III : Problems on Demoivre's Theorem and Applications :

49. The Demoivre's theorem states that for any real number n, one of the values of $(\cos\theta + i\sin\theta)^n$ is (1)

(A) $\cos n\theta - i\sin n\theta$ (B) $\cos^n\theta + i\sin^n\theta$

(C) $\cos n\theta + i\sin n\theta$ (D) none of these

50. If $x=\cos\theta + i\sin\theta$, then $x^n + \frac{1}{x^n}$ is equal to (2)

(A) $2\sin n\theta$ (B) $2\cos n\theta$

(C) $2(\cos n\theta + i\sin n\theta)$ (D) none of these

51. Using Demoivre's theorem, simplified form of $\frac{\left(\sin\frac{\pi}{8}+i\cos\frac{\pi}{8}\right)^8}{\left(\sin\frac{\pi}{8}-i\cos\frac{\pi}{8}\right)^8}$ is equal to (2)

(A) –1 (B) 2i

(C) 0 (D) 1

52. Using Demoivre's theorem, simplified form of $(\sin\theta + i\cos\theta)^4$ is equal to (2)

(A) $(\sin 4\theta + \cos 4\theta)$ (B) $(\sin 4\theta - i\cos 4\theta)$

(C) $(\cos 4\theta + i\sin 4\theta)$ (D) $(\cos 4\theta - i\sin 4\theta)$

53. Using Demoivre's theorem, simplified form of $\frac{(1+i\sqrt{3})^6}{(1-i\sqrt{3})^6}$ is equal to (2)

(A) $e^{-i\pi}$ (B) $e^{i4\pi}$ (C) $e^{\frac{i\pi}{2}}$ (D) $e^{\frac{i3\pi}{2}}$

54. Using Demoivre's theorem, simplified form of $\frac{(\sqrt{3}-i)^4}{(\sqrt{3}+i)^8}$ is equal to (2)

(A) $\frac{1}{2^4}e^{-i2\pi}$ (B) $\frac{1}{2^4}e^{i\pi}$

(C) $e^{i2\pi}$ (D) $e^{-i2\pi}$

55. Using Demoivre's theorem, simplified form of $\frac{\left(1+\cos\frac{\pi}{8}+i\sin\frac{\pi}{8}\right)^8}{\left(1+\cos\frac{\pi}{8}-i\sin\frac{\pi}{8}\right)^8}$ is equal to (2)

(A) $1+i$ (B) –1

(C) $1-i$ (D) 1

56. Using Demoivre's theorem, simplified form of $(1+i)^8 + (1-i)^8$ is equal to

(A) 2^8 (B) 2^5

(C) $2^4 \cos\frac{\pi}{4}$ (D) $2^8 \cos\frac{\pi}{8}$

57. If $z = -1 + i$, then using Demoivre's theorem, z^4 is equal to

(A) -4 (B) 4

(C) $4i$ (D) none of these

58. If $z = \frac{\sqrt{3}}{2} + i\frac{1}{2}$, then using Demoivre's theorem, z^{12} is equal to

(A) $-i$ (B) -1

(C) 1 (D) i

59. Using Demoivre's theorem, exponential form of the expression $\left(\frac{\sqrt{3}}{2} + i\frac{1}{2}\right)^{1000}$ is

(A) $e^{-i\frac{1000\pi}{6}}$ (B) $e^{+i\frac{1000\pi}{6}}$

(C) $e^{i\frac{1000\pi}{3}}$ (D) none of these

60. If $\left[2\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)\right]^6 = a + ib$, then

(A) $a = -2^6$ and $b = 0$ (B) $a = 2^6$ and $b = 0$

(C) $a = -2^6$ and $b = 1$ (D) none of these

61. The roots of equation $x^3 - 1 = 0$ are

(A) $\cos\frac{(2k+1)\pi}{3} + i\sin\frac{(2k+1)\pi}{3}, k = 0, 1, 2$

(B) $\cos\frac{(2k-1)\pi}{3} + i\sin\frac{(2k-1)\pi}{3}, k = 0, 1, 2$

(C) $\cos\frac{2k\pi}{3} + i\sin\frac{2k\pi}{3}, k = 0, 1, 2$

(D) none of these

62. The roots of equation $x^3 + 1 = 0$ are

(A) $\cos\frac{(2k+1)\pi}{3} + i\sin\frac{(2k+1)\pi}{3}, k = 0, 1, 2$

(B) $\cos\frac{(2k-1)\pi}{3} + i\sin\frac{(2k-1)\pi}{3}, k = 0, 1, 2$

(C) $\cos\frac{2k\pi}{3} + i\sin\frac{2k\pi}{3}, k = 0, 1, 2$

(D) none of these

63. All the values of $(1 + i\sqrt{3})^{1/3}$ are (2)

(A) $2^{1/3}\left[\cos\frac{(6k-1)\pi}{9} + i\sin\frac{(6k-1)\pi}{24}\right], k = 0, 1, 2$

(B) $2^{1/3}\left[\cos\frac{(6k+1)\pi}{9} - i\sin\frac{(6k+1)\pi}{9}\right], k = 0, 1, 2$

(C) $2^{1/3}\left[\cos\frac{(6k+1)\pi}{9} + i\sin\frac{(6k+1)\pi}{9}\right], k = 0, 1, 2$

(D) none of these

64. If the cube roots unity are 1, $\alpha = \left(\cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}\right)$ and $\beta = \left(\cos\frac{2\pi}{3} - i\sin\frac{2\pi}{3}\right)$ then the value of $1 + \alpha^{3n} + \beta^{3n}$, where n is any integer, is (2)

(A) 0 (B) 1

(C) 2 (D) 3

65. The n^{th} roots of unity are given by $x_0 = e^{i0}, x_1 = e^{i\frac{2\pi}{n}}, x_2 = e^{i\frac{4\pi}{n}}, \ldots, x_{n-1} = e^{i\frac{2(n-1)\pi}{n}}$ then product of these roots $x_0 \cdot x_1 \cdot x_2 \ldots, x_{n-1}$ is (2)

(A) –1 (B) $(-1)^n$

(C) 0 (D) $(-1)^{n+1}$

66. All the values of $(i)^{1/3}$ are (2)

(A) $\left[\cos\frac{(4k+1)\pi}{6} + i\sin\frac{(4k+1)\pi}{6}\right], k = 0, 1, 2$

(B) $\left[\cos\frac{(4k+1)\pi}{6} - i\sin\frac{(4k+1)\pi}{6}\right], k = 0, 1, 2$

(C) $\left[\cos\frac{(4k+1)\pi}{3} + i\sin\frac{(4k+1)\pi}{3}\right], k = 0, 1, 2$

(D) none of these

67. All the values of $(-i)^{1/3}$ are (2)

(A) $\left[\cos\frac{(4k+1)\pi}{6} - i\sin\frac{(4k+1)\pi}{6}\right], k = 0, 1, 2$

(B) $\left[\cos\frac{(4k-1)\pi}{6} + i\sin\frac{(4k-1)\pi}{6}\right], k = 0, 1, 2$

(C) $\left[\cos\frac{(4k+1)\pi}{3} + i\sin\frac{(4k+1)\pi}{3}\right], k = 0, 1, 2$

(D) none of these

68. All the values of $(1 - i\sqrt{3})^{1/4}$ are

(A) $2^{1/4}\left[\cos\dfrac{(6k-1)\pi}{24} + i\sin\dfrac{(6k-1)\pi}{24}\right]$, $k = 0, 1, 2, 3$

(B) $2^{1/4}\left[\cos\dfrac{(6k+1)\pi}{12} + i\sin\dfrac{(6k+1)\pi}{12}\right]$, $k = 0, 1, 2, 3$

(C) $2^{1/4}\left[\cos\dfrac{(6k+1)\pi}{12} - i\sin\dfrac{(6k+1)\pi}{12}\right]$, $k = 0, 1, 2, 3$

(D) none of these

69. All the values of $(1 + i)^{1/5}$ are

(A) $2^{1/10}\left[\cos\dfrac{(8k+1)\pi}{20} + i\sin\dfrac{(8k+1)\pi}{20}\right]$, $k = 0, 1, 2, 3, 4$

(B) $2^{1/10}\left[\cos\dfrac{(8k-1)\pi}{20} + i\sin\dfrac{(8k-1)\pi}{20}\right]$, $k = 0, 1, 2, 3, 4$

(C) $2^{1/10}\left[\cos\dfrac{2k\pi}{5} + i\sin\dfrac{2k\pi}{5}\right]$, $k = 0, 1, 2, 3, 4$

(D) none of these

Answers

1. (A)	15. (C)	29. (B)	43. (D)	57. (A
2. (A)	16. (C)	30. (A)	44. (A)	58. (C
3. (C)	17. (D)	31. (B)	45. (A)	59. (B
4. (A)	18. (B)	32. (A)	46. (B)	60. (A
5. (A)	19. (B)	33. (D)	47. (A)	61. (C
6. (A)	20. (A)	34. (B)	48. (B)	62. (A
7. (A)	21. (A)	35. (D)	49. (C)	63. (C
8. (A)	22. (C)	36. (A)	50. (B)	64. (D
9. (C)	23. (C)	37. (A)	51. (D)	65. (D
10. (B)	24. (D)	38. (A)	52. (D)	66. (A
11. (A)	25. (B)	39. (A)	53. (B)	67. (B
12. (B)	26. (A)	40. (A)	54. (A)	68. (C
13. (A)	27. (A)	41. (C)	55. (B)	69. (A
14. (C)	28. (C)	42. (B)	56. (B)	

MULTIPLE CHOICE QUESTIONS

Type I : Hyperbolic functions :

1. Hyperbolic functions sinh x and cosh x are respectively
   (A) even and odd (B) odd and even
   (C) odd and odd (D) even and even
2. e^z is a periodic function of period
   (A) πi (B) 2π
   (C) $2\pi i$ (D) none of these
3. Inverse hyperbolic function $\tanh^{-1} x$ is
   (A) $\frac{1}{2}\log\frac{1+x}{1-x}$ (B) $\frac{1}{2}\log\frac{1-x}{1+x}$
   (C) $\log\frac{1+x}{1-x}$ (D) $\log\frac{1-x}{1+x}$
4. Inverse hyperbolic function $\cosh^{-1} x$ is
   (A) $\log\left(x+\sqrt{x^2-1}\right)$ (B) $\log\left(x+\sqrt{x^2+1}\right)$
   (C) $\log\left(x-\sqrt{x^2-1}\right)$ (D) none of these
5. Inverse hyperbolic function $\sinh^{-1} x$ is
   (A) $\log\left(x+\sqrt{x^2-1}\right)$ (B) $\log\left(x+\sqrt{x^2+1}\right)$
   (C) $\log\left(x-\sqrt{x^2-1}\right)$ (D) none of these
6. Which of the following is true ?
   (A) $\cosh^2 x + \sinh^2 x = 1$ (B) $\cosh^2 x - \sinh^2 x = 1$
   (C) $\sinh^2 x - \cosh^2 x = 1$ (D) $\cosh^2 x - \sinh^2 x = 2$
7. Which of the following is true ?
   (A) $\cosh^2 x + \sinh^2 x = 1$
   (B) $\sinh(x+y) = \sinh x \cdot \cosh y + \cosh y \sinh x$
   (C) $\sinh^2 x - \cosh^2 x = 1$
   (D) $\cosh^2 x - \sinh^2 x = 2$
8. Which of the following is true ?
   (A) $\sin(x+iy) = \sin x \cosh y - i \cos x \sinh y$
   (B) $\sin(x+iy) = i \sin x \cosh y + \cos x \sinh y$
   (C) $\sin(x+iy) = \sin x \cosh y + i \cos x \sinh y$
   (D) $\sin(x+iy) = i \sin x \cosh y - \cos x \sinh y$

9. If $y = \sinh x$ then $\frac{dy}{dx}$ is equal to (1)

(A) $\sinh x$ (B) $\cosh x$

(C) $-\sinh x$ (D) $-\cosh x$

10. If $y = \cosh x$ then $\frac{dy}{dx}$ is equal to (1)

(A) $\sinh x$ (B) $\cosh x$

(C) $-\sinh x$ (D) $-\cosh x$

11. $\int \sinh x dx$ is equal to (1)

(A) $\sinh x$ (B) $\cosh x$

(C) $-\sinh x$ (D) $-\cosh x$

12. $\int \cosh x dx$ is equal to (1)

(A) $\sinh x$ (B) $\cosh x$

(C) $-\sinh x$ (D) $-\cosh x$

13. If $\tan(x + iy) = p + iq$ then $\tan(x - iy)$ is equal to (1)

(A) $p - iq$ (B) $p + iq$

(C) $ip - q$ (D) $p - q$

14. Simplification of the expression $\cosh^3 x$ is (2)

(A) $\frac{1}{4}[\cosh 3x + 3\cosh x]$ (B) $-\frac{1}{4}[\cosh 3x + 3\cosh x]$

(C) $\frac{1}{4}[\sinh 3x - 3\sinh x]$ (D) none of these

15. Simplification of the expression $\sinh^3 x$ is (2)

(A) $\frac{1}{4}[\cosh 3x + 3\cosh x]$ (B) $-\frac{1}{4}[\cosh 3x + 3\cosh x]$

(C) $\frac{1}{4}[\sinh 3x - 3\sinh x]$ (D) none of these

16. The value of $\tanh\left(\log\sqrt{3}\right)$ is equal to (2)

(A) 1 (B) 2

(C) $\frac{1}{2}$ (D) none of these

17. The value of $\sinh^{-1}\left(-\frac{3}{4}\right)$ is equal to (2)

(A) $-\log 2$ (B) $\log 2$

(C) $-\frac{3}{4}$ (D) none of these

18. The value of $\cosh^{-1}\left(i\frac{3}{4}\right)$ is equal to

(A) $\log(2i)$
(B) $\log(i)$
(C) $i\frac{3}{4}$
(D) none of these

19. If $\tan(x + iy) = i$ then x is equal to

(A) 0
(B) 1
(C) $\frac{0}{0}$
(D) ∞

20. If $\sin(\alpha + i\beta) = x + iy$ then $\frac{x^2}{\cosh^2\beta} + \frac{y^2}{\sinh^2\beta}$ is equal to

(A) 1
(B) 0
(C) -1
(D) ∞

21. If $\sin(\alpha + i\beta) = x + iy$ then $\frac{x^2}{\sin^2\alpha} - \frac{y^2}{\cos^2\alpha}$ is equal to

(A) 1
(B) 0
(C) -1
(D) ∞

22. If $\cos a \cosh b - i \sin a \sinh b = \frac{3i}{4}$ then the value of a is

(A) 0
(B) $\frac{3}{4}$
(C) π
(D) $\frac{\pi}{2}$

23. If $\tan\frac{x}{2} = \tanh\frac{u}{2}$ then the value of $\sinh u$ is equal to

(A) $\tanh\frac{x}{2}$
(B) $\cosh\frac{x}{2}$
(C) $\tan x$
(D) $\cos x$

24. Simplification of the expression $\dfrac{1}{1 - \dfrac{1}{1 - \cosh^2 x}}$ is

(A) $\coth^2 x$
(B) $\text{sech}^2 x$
(C) $\tanh^2 x$
(D) none of these

25. If $x = \tanh^{-1}\frac{1}{2}$ then the value of $\sinh 2x$ is equal to

(A) $\frac{3}{4}$
(B) $\frac{4}{3}$
(C) 2
(D) $\frac{1}{2}$

26. If $x = \tanh^{-1}\frac{1}{2}$ then the value of cosh 2x is equal to (2)

(A) $\frac{4}{3}$ (B) $\frac{3}{5}$

(C) $\frac{5}{3}$ (D) $\frac{3}{4}$

Type II : Logarithms of Complex Numbers :

27. General value of logarithm of complex number (x + iy) is (1)

(A) $\log(x+iy) = \log\sqrt{x^2+y^2} + i\tan^{-1}\frac{y}{x}$

(B) $\log(x+iy) = \log\sqrt{x^2+y^2} + i\left(2n\pi + \tan^{-1}\frac{y}{x}\right)$

(C) $\log(x+iy) = \log\sqrt{x^2+y^2} + i\tan^{-1}\frac{x}{y}$

(D) $\log(x+iy) = \log\sqrt{x^2+y^2} - i\left(2n\pi + \tan^{-1}\frac{x}{y}\right)$

28. Principle value of logarithm of complex number (x + iy) is (1)

(A) $\log(x+iy) = \log\sqrt{x^2+y^2} + i\tan^{-1}\frac{y}{x}$

(B) $\log(x+iy) = \log\sqrt{x^2+y^2} + i\left(2n\pi + \tan^{-1}\frac{y}{x}\right)$

(C) $\log(x+iy) = \log\sqrt{x^2+y^2} + i\tan^{-1}\frac{x}{y}$

(D) $\log(x+iy) = \log\sqrt{x^2+y^2} - i\left(2n\pi + \tan^{-1}\frac{x}{y}\right)$

29. The general value of logarithm of complex number log (1 + i tan α) is (2)

(A) $\log(\cot\alpha) + i(2n\pi + \alpha)$ (B) $\log(\sec\alpha) - i(2n\pi + \alpha)$

(C) $\log(\sec\alpha) + i(2n\pi + \alpha)$ (D) $i(2n\pi + \alpha)$

30. The general value of logarithm of complex number $(1 + i\sqrt{3})$ is (2)

(A) $\log 4 + i\left(2n\pi + \frac{\pi}{3}\right)$ (B) $\log 2 + i\left(2n\pi + \frac{\pi}{6}\right)$

(C) $\log 2 + i\left(2n\pi + \frac{\pi}{3}\right)$ (D) $\log 4 + i\left(2n\pi - \frac{\pi}{4}\right)$ (2)

31. The value of $\log_{(1-i)}(1+i)$ is

(A) $\dfrac{\log\sqrt{2} + i\frac{\pi}{4}}{\log\sqrt{2} - i\frac{\pi}{4}}$ (B) $\dfrac{\log\sqrt{2} - i\frac{\pi}{4}}{\log\sqrt{2} + i\frac{\pi}{4}}$

(C) $\dfrac{\log 2 + i\frac{\pi}{4}}{\log 2 - i\frac{\pi}{4}}$ (D) none of these

32. Principal value of logarithm of (–5) is (2)

(A) $-\log 5 - i\pi$ (B) $-\log 5 + i\pi$ (C) $\log 5 - i\pi$ (D) $\log 5 + i\pi$

33. The value of i^i is (2)

(A) $\frac{\pi}{2}$ (B) $-\frac{\pi}{2}$ (C) $e^{\pi/2}$ (D) $e^{-\pi/2}$

34. The value of i^{1+i} is (2)

(A) $e^{i\frac{\pi}{2}-\frac{\pi}{2}}$ (B) $e^{i\frac{\pi}{2}+\frac{\pi}{2}}$ (C) $e^{-i\frac{\pi}{2}-\frac{\pi}{2}}$ (D) none of these

35. The value of sin (log i^i) is (2)

(A) 0 (B) 1 (C) –1 (D) i

36. If $\log[\log(x+iy)] = p + iq$ then the value of $\tan^{-1}\left(\frac{y}{x}\right)$ is (2)

(A) $e^p \cos q$ (B) $e^q \sin p$ (C) $e^q \cos p$ (D) $e^p \sin q$

37. The value of $\log\left(\frac{x+iy}{x-iy}\right)$ is equal to (2)

(A) $2\sqrt{x^2+y^2}$ (B) $2\log\sqrt{x^2+y^2}$ (C) $2i\tan^{-1}\left(\frac{y}{x}\right)$ (D) $2\tan^{-1}\left(\frac{y}{x}\right)$

38. The value of $\log\left(\frac{1-i\sqrt{3}}{1+i\sqrt{3}}\right)$ is equal to (2)

(A) 2 log 4 (B) 2 log 2 (C) $2i\frac{\pi}{3}$ (D) $-2i\frac{\pi}{3}$

39. The value of $\tanh\left(\log\sqrt{5}\right)$ is equal to (2)

(A) $\frac{3}{2}$ (B) $\frac{2}{3}$ (C) 0 (D) $\sqrt{5}$

40. If $\tan(x+iy) = \alpha + i\beta$ then (2)

(A) $\tan 2x = \frac{2\alpha}{1-\alpha^2-\beta^2}$ (B) $\tan 2x = \frac{2\alpha}{1+\alpha^2+\beta^2}$

(C) $\tan 2x = \frac{2\beta}{1-\alpha^2-\beta^2}$ (D) $\tan 2x = \frac{2\beta}{1+\alpha^2+\beta^2}$

41. If sinh z = i then (2)

(A) $x = 0, y = 0$ (B) $x = \frac{\pi}{2}, y = 0$ (C) $x = 0, y = \frac{\pi}{2}$ (D) $x = \frac{\pi}{2}, y = \frac{\pi}{2}$

Answers

1. (B)	8. (C)	15. (C)	22. (D)	29. (C)	36. (D)
2. (C)	9. (B)	16. (C)	23. (C)	30. (C)	37. (C)
3. (A)	10. (A)	17. (A)	24. (C)	31. (A)	38. (D)
4. (A)	11. (B)	18. (A)	25. (B)	32. (D)	39. (B)
5. (B)	12. (A)	19. (C)	26. (C)	33. (D)	40. (A)
6. (B)	13. (A)	20. (A)	27. (B)	34. (A)	41. (C)
7. (B)	14. (A)	21. (A)	28. (A)	35. (C)	