Complex Number

1) If $(cos\theta + isin\theta)^n = cosn\theta + isinn\theta$ .then n is ……….
   a) Imaginary number b) Complex number
   b) Transcendental number **d**) Rational number
2) If 1, w, w^2 are roots of unity then 1 + w + w^2 =…………
   a) 1 **b)** 0 c) -1 d) ½
3) For any real number , cosθ =…………
   a) $\frac{e^{i\theta}-e^{-i\theta}}{2i}$ **b)** $\frac{e^{i\theta}+e^{-i\theta}}{2}$ c) $\frac{e^{i\theta}-e^{-i\theta}}{2}$ d) $\frac{e^{i\theta}+e^{-i\theta}}{2i}$
4) If ω is a complex cube root of unity then $1+\omega = \cdots \ldots \ldots \ldots$
   a) 0 **b)** $-\omega^2$ c) $-\omega$ d) -1
5) For any number z, sinz = ………..
   a) Sinhz **b)** –isiniz c) –isinhiz d) isinhiz
6) Every real number is complex number whose imaginary part is ……
   a) -1 **b)** 0 c) 1 d) 2
7) For any real number θ ,sinθ =…………
   b) $\boldsymbol{\frac{e^{i\theta}-e^{-i\theta}}{2i}}$ b) $\frac{e^{i\theta}+e^{-i\theta}}{2}$ c) $\frac{e^{i\theta}-e^{-i\theta}}{2}$ d) $\frac{e^{i\theta}+e^{-i\theta}}{2i}$
8) For any number z, coshiz = ………..
   b) cosiz b) cosz **c)** coshz d) -coshz
9) For any number θ , $e^{i\theta} = \cdots$….
   c) -cos θ -isin θ b) -cos θ +isin θ c) cos θ -isin θ **d)** cos θ +isin θ
10) For any complex z, $sinh^{-1}z = \cdots \ldots \ldots$..
   a) $\log(z-\sqrt{z^2}-1)$ b) $\log(z-\sqrt{z^2}+1)$
   b) $\log(z+\sqrt{z^2}+1)$ **d)** $\log(z+\sqrt{z^2}-1)$
11) For any number z, sinhz = …………
   a) $\frac{e^{z}-e^{-z}}{2i}$ b) $\frac{e^{z}+e^{-z}}{2}$ **c)** $\frac{e^{z}-e^{-z}}{2}$ d) $\frac{e^{z}+e^{-z}}{2i}$
12) For any complex number z, coshz = ……….
   a) **Cosiz** b) icosz c) - cosiz d) i^2cosz
13) For any real of complex number z, sin h iz =………..
   a) Sinz **b)**isinz c) cosz d) icosz
14) The value of $tannh^{-1}(\frac{1}{2}) = \cdots \ldots \ldots$..
   a) log 3 **b)** log$\sqrt{3}$ c) log 2 d) log$\sqrt{2}$
15) If n is rational number then $(sin\theta + icos\theta)^n$ =……….
   a) $sinn\theta + icosn\theta$ b) $cosn\theta + isinn\theta$
   b) $\sin\left(\frac{n\pi}{2}-n\theta\right) + icos(\frac{n\pi}{2}-n\theta)$ **d)** $\cos\left(\frac{n\pi}{2}-n\theta\right) + isin(\frac{n\pi}{2}-n\theta)$
16) For any real or complex number z, tan h z =…………..
   a) $\frac{e^{iz}-e^{-iz}}{e^{iz}+e^{-iz}}$ b) $\frac{e^{iz}+e^{-iz}}{e^{iz}-e^{-iz}}$ **c)** $\frac{e^{z}-e^{-z}}{e^{z}+e^{-z}}$ d) $\frac{e^{z}+e^{-z}}{e^{z}-e^{-z}}$
17) The value of $cosh(\frac{\pi}{3}i) = \cdots \ldots \ldots$..
   a) $\frac{\sqrt{3}}{2}$ **b)** $\frac{1}{2}$ c) 0 d) 1

18) If $x = \cos\theta + i\sin\theta$, then $x^n + \dfrac{1}{x^n} = ...$

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

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

19) Using DeMoivre's theorem, $\dfrac{\left(1+i\sqrt{3}\right)^6}{\left(1-i\sqrt{3}\right)^6} = ...$

A) $e^{-i\pi}$ **B)** $e^{4i\pi}$

C) $e^{i\pi/2}$ D) $e^{i3\pi/2}$

20) If $z = -1+i$, then using DeMoivre's theorem, $z^4 = ...$

A) -4 **B) 4** C) 4i D) none of these

21) The roots of the equation $x^3 - 1 = 0$ are ….

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

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

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

D) None of these

22) 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) $\cosh^2 x - \sinh^2 x = 2$

23) If $y = \sinh x$ then $\dfrac{dy}{dx} = ...$

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

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

24) If $\tan(x+iy) = p+iq$ then $\tan(x-iy) = ...$

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

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

25) The expression $\sinh^3 x = \ldots.$

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

26) The value of $\tanh\left(\log\sqrt{3}\right) = \ldots.$

A) 1 B) 2

C) ½ D) none of these

27) The value of $i^i = \ldots.$

A) $\frac{\pi}{2}$ B) $-\frac{\pi}{2}$

C) $e^{\pi/2}$ **D)** $e^{-\pi/2}$

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

A) $e^p \cos q$ B) $e^q \sin p$

C) $e^q \cos p$ D) $e^p \sin q$

29) The value of $\log\left(\frac{x+iy}{x-iy}\right) = \ldots$

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) $2\tan^{-1}\left(\frac{y}{x}\right)$

30) If $\sinh z = i$, then ….

A) $x=0, y=0$ B) $z=\frac{\pi}{2}, y=0$

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

31) If $x=\tanh^{-1}\left(\frac{1}{2}\right)$ then the value of $\sinh 2x = \ldots.$

A) 3/4 B) 4/3

C) 2 D) ½

32) If $x+iy=\sqrt{2}+3i$, then x^2+y is ….

A) 7 **B) 5** C) 13 D) $\sqrt{2}+3$

33) The real part of $(\sin x + i\cos x)^5$ is ….

A) $-\cos 5x$ B) $-\sin 5x$ C) $\sin 5x$ **D)** $\cos 5x$

34) The number $(i)^i$ is ….

A) a purely imaginary number

B) an irrational number

C) **a rational number**

D) an integer

35) z is a complex number with $|z|=1$ and $\arg(z)=\frac{3\pi}{4}$. The value of z is …

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

36) If $f(z)=e^{2z}$, then the imaginary part of $f(z)$ is …

A) $e^y \sin x$ B) $e^x \cos y$ C) $e^{2x}\cos 2y$ D) $e^{2x}\sin 2y$

37) The value of $\sinh\left(\frac{\pi i}{2}\right)$=…..

A) 0 B) 1 **C) i** D) –i

38) The value of $(1+i)^8$ =…

A) 2 B) 4 C) 8 D) 16

39) The value of $(1-i)^8$ =…

A) 2 B) 4 C) 8 D) 16

40) The polar form of $\left(\frac{1}{2}+i\frac{\sqrt{3}}{2}\right)$ is ….

A) $\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}$ C) $\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}$

B) $\cos\frac{\pi}{4}-i\sin\frac{\pi}{4}$ D) $\cos\frac{\pi}{3}-i\sin\frac{\pi}{3}$

41) If $\alpha=1+i\sqrt{3}$ then α^6 =….

A) 0 B) 1 C) 2 D) 3

EXTREME VALUES

1) A function f(x, y) has an extreme value at (a, b) then …………
   a) $AC-B^2>0$ c) $AC-B^2=0$
   b) $AC-B^2<0$ d) $AB-c^2>0$
2) The Lagrange's method of undetermined multipliers is used for find the extreme value of a function of ………..
   a) One variable c) three or more variables
   b) two variables d) no variables.
3) A function f(x , y) is maximum at a point (a, b) if …
   a) $AC-B^2>0\ and\ A<0$ c) $AC-B^2<0\ and\ A>0$
   b) $AC-B^2>0\ and\ A>0$ d) $AC^2-B^2<0\ and\ A<0$
4) A function f(x , y) is minimum at a point (a, b) if ……………
   a) $AC-B^2>0\ and\ A<0$ c) $AC-B^2<0\ and\ A>0$
   b) $AC-B^2>0\ and\ A>0$ d) $AC^2-B^2<0\ and\ A<0$
5) If f(x , y)= x^3+y^3-3xy then AC – B^2 at (1 , 1) is ………..
   a) -9 b) 0 c) 36 d) 27
6) If f(x , y)= x^3+y^3-3xy then AC – B^2 at (0 , 0) is ………..
   a) -9 b) 0 c) 36 d) 27
7) To find extreme values of u = f(x ,y , z) subject to two conditions we choose λ such as ……………
   a) No need of λ c) two values of λ
   b) one value of λ d) many values of λ
8) A function f(x, y) has an extreme value at (a, b) then …………
   a) F(x , y) is maximum at (a, b)
   b) F(x , y) is minimum at (a, b)

c) F(x , y) is maximum or minimum at (a, b)
d) F(x , y) is maximum and minimum at (a, b)

9) A function f(x, y) has an extreme value at (a, b) and let A = f_{xx} (a , b) then f(x, y) is minimum if …………….

a) $A < 0$ b) $A = 0$ c) $A \leq 0$ d) $A > 0$

10) The function z = f(x, y) has extreme value if …………

a) $AC > B^2$
c) $A - C > B^2$
b) $AC < B^2$
d) $A + B > B^2$

11) A function is said to be stationary if it is ……………

a) Maximum
c) minimum
b) either maximum or minimum
d) none of these

12) Let $S \subseteq R\ x\ R, f: S \to R$ be a function of two variables , f is said to be maximum at point (a ,b) $\in S$ if for all (x , y) in some neighborhood of (a , b)…

a) $f(x,y) \leq f(a,b)$
c) $f(x,y) \geq f(a,b)$
b) F(x) = f(y) = f(a , b)
d) none of these

13) A function f(x , y) is maximum at a point (a, b) if f_x (a , b) = f_y (a , b) =0 , $AC - B^2 > 0$ and

a) $A < 0$ b) $A = 0$ c) $A = 0$ d) $A = 1$

14) To find extreme values of u = f(x, y, z) subject to one constraint, we choose …

a) No need of λ
c) two values of λ
b) one value of λ
d) many values of λ

PARTIAL DERIVATIVES

1) If $z = x^2y\ then\ \frac{\partial^2 z}{\partial x^2}\ is$ ...

a) x
c) $2xy$
b) x^2
d) 0

2) If u is a function of x, y, z then to find $\frac{\partial u}{\partial x}$, we take ………… as constant.

a) x b) y c) y and z d) x and y

3) If u is a function of x, y, z then to find $\frac{\partial u}{\partial y}$, we take ………… as constant.

b) X b) y c) y and z d) x and y

4) If $u = \frac{x^3+y^3}{x-y}\ then\ x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \cdots$

a) 2u b) 3u c) u d) 4u

5) The degree of homogenous function $f(x,y) = \frac{\sqrt{x} - \sqrt{y}}{\sqrt{x} + \sqrt{y}}\ is$ ... ...

a) 1 b) ½ c) 0 d) -1/2

6) If $z = x^2 + y^2\ \ , x = at^2\ \ , y = 2at\ \ then\ \frac{dz}{dt} = \cdots$ ... ...

a) $4a(t^3 + 2t)$
c) $a^2(t^3 + 2t)$
b) $4a^3(t^3 + 2t)$
d) $4a^2(t^3 + 2t)$

7) The degree of homogenous function $f(x,y) = \frac{\sqrt{x}+\sqrt{y}}{x+y}\ is$ ... ...

a) 1 b) ½ c) 0 d) -1/2

8) If $u = tan^{-1}\left[\frac{x^3+y^3}{x-y}\right]$ then tan u is homogenous function of degree ……..

a) 3 b) 1 c) 2 d) 6

9) If u = $\frac{\sqrt{x}-\sqrt{y}}{\sqrt{x}+\sqrt{y}}$, then $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\cdots$ ... ...

a) $\sqrt{u}$ b) u c) 0 d) none of these

10) The degree of homogenous function $f(x,y)=\frac{x^{1/3}+y^{1/3}}{x^{1/2}+y^{1/2}}$ is ... ...

a) 1/12 b)- 1/6 c) 1/6 d) -1/12

11) If $x=rcos\theta$, $y=rsin\theta$ $, then$ $\frac{1}{r}\frac{\partial x}{\partial \theta}=\cdots$

a) $\frac{1}{r}\frac{\partial \theta}{\partial x}$ b) $r\frac{\partial x}{\partial \theta}$ c) $-\frac{1}{r}\frac{\partial x}{\partial \theta}$ d) $r\frac{\partial \theta}{\partial x}$

Successive Differentiation

1) The value of $D^n(ax+b)^{-1}$ is…

a) $\frac{(-1)^{n-1}(n-1)!a^n}{(ax+b)^n}$ c) $\frac{(-1)^n n!a^n}{(ax+b)^{n+1}}$

b) $n!\,a^n(ax+b)^{-n-1}$ d) $(n-1)!\,a^{n-1}(ax+b)^{-n}$

2) If $y=(sin^{-1}x)^2$ then $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}=$…

a) 2 b) 4 c) 0 d) -2

3) If y = e^{ax} then y_n is …

a) $a^{n+1}e^{ax}$ b) $a^n e^{ax}$ c) $a^{n-1}e^{ax}$ d) $a^{2n}e^{ax}$

4) If $y=\sin(ax+b)$ $then\ y_7$ =…

a) $a^7\sin(ax+b)$ c) $a^7\cos(ax+b)$

b) $-a^7\sin(ax+b)$ d) $a^7\cos(ax+b)$

5) If $y=(ax+b)^n$ $then\ y_{n+1}=\cdots$

a) $n(ax+b)^{n-1}$ c) $(n+1)!$

b) $n!$ d) 0

6) If $y=a^x$ $then\ y_n=\cdots$

a) $a^x loga$ c) $a^x(loga)^n$

b) $(a^x)^n loga$ d) $(loga)^n$

7) If $y=\sin(ax+b)$ $then\ y_n$ =…

a) $a^n\sin(ax+b)$ c) $a^n\cos(ax+b)$

b) $a^n\sin\left(ax+b+\frac{n\pi}{2}\right)$ d) $a^7\cos\left(ax+b\ \frac{n\pi}{2}\right)$

8) If $y=\cos(ax+b)$ $then\ y_n$ =…

a) $a^n\sin(ax+b)$ c) $a^n\cos(ax+b)$

b) $a^n\cos\left(ax+b\ \frac{n\pi}{2}\right)$ d) $a^n\sin\left(ax+b+\frac{n\pi}{2}\right)$

9) If $y=6^{mx}$ $then\ y_n\ is$ …

a) $m^n 6^{mx}$ c) $6^{mx}\ (log6)^n$

b) $m^n\ 6^{mx}$ (log6)^n d) $m^n\ (log6)^n$

10) If y = x Sin3x then y_n is…

a) $sin3x + 3xcos3x$

b) $3^n x \sin(3x + \frac{n\pi}{2}) + n3^{n-1}\sin[3x + (n-1)\frac{\pi}{2}$

c) $3^n \sin(3x + \frac{n\pi}{2})$

d) 0

11) If $y = \log(2x - 5)$ $then\ y_n = \cdots$

a) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-5)^n}$

c) $\frac{(-1)^n n!2^n}{(2x-5)^n}$

b) $\frac{(-1)^{n-1}(n-1)!2^n}{(2x-5)^{n+1}}$

d) $\frac{(-1)^{n-1} n!2^n}{(2x-5)^n}$

12) If $y = a^{mx}$ $then\ y_n = \cdots$

a) $m^n a^{mx}(\log a)^n$

c) $a^{mx}\log a$

b) $n^m a^{nx}(log a)^m$

d) 0

13) If $y = \log(4 + 6x)$ $then\ y_n\ is$ ...

a) $\frac{(n-1)!6^n}{(4+6x)^n}$

c) $\frac{(-1)^n(n-1)!6^n}{(4+6x)^n}$

b) $\frac{(-1)^{n-1}(n-1)!6^n}{(4+6x)^n}$

d) $\frac{(-1)^{n-1}(n-1)!6^n}{(4+6x)^{n+1}}$

14) If $y = (5x + 6)^n$ $then\ y_n = \cdots$

a) $n!$

b) $5^{n+1}n!$

c) $5.n!$

d) $5^n n!$

15) If $y = \log(ax + b)$ $then\ y_n = \cdots$

a) $\frac{(-1)^n n! a^n}{(ax+b)^{n+1}}$

c) $\frac{(-1)^{n-1}(n-1)!a^n}{(ax+b)^n}$

b) $\frac{(-1)^{n-1}(n-1)!a^n}{(ax+b)^{n+1}}$

d) $\frac{(-1)^{n-1}(n-1)!a^n}{(ax+b)^n}$

16) If y = e^{3x} then y_n is …

a) $3^n e^x$

b) $3^n e^3$

c) $x^3 e^3$

d) $3^n e^{3x}$

17) $\frac{(-1)^n n!2^n}{(2x+3)^{n+1}}$ is n^{th} derivative of ...

a) $\log(2x + 3)$

b) $\log\left(\frac{1}{2x+3}\right)$

c) $\frac{1}{2x+3}$

d) $\frac{1}{3x+2}$

18) n^{th} derivative of sinx. cosx is ...

a) $2^{n-1}\sin\left(2x + \frac{n\pi}{2}\right)$

c) $2^n \sin\left(2x + \frac{n\pi}{2}\right)$

b) $2^n \sin x$

d) $2^n \sin 2x$