Question 1

Determine the validity of the statements:

$\boldsymbol{S}$ **:** The complex function $f(z) = z^2$ is continuous for all z.

$\boldsymbol{T}$ **:** The complex exponential function is not periodic.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 2

Determine the validity of the statements:

S : The complex exponential function is periodic.

T : The complex function $f(z) = |z|$ is continuous for all z.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 3

Determine the validity of the statements:

S : The complex function $f(z) = \overline{z}$ is continuous for all z.

T : The complex function $f(z) = i\sqrt[3]{xy}$ is continuous for all z.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 4

Determine the validity of the statements:

S : The complex function $f(z) = i\sqrt[3]{xy}$ is differentiable at $z = 0 + 0i$.

T : The complex function $f(z) = z^2$ is differentiable for all z.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 5

Determine the validity of the statements:

$\boldsymbol{S}$ **:** The complex function $f(z) = \overline{z}$ is not differentiable at any point.

$\boldsymbol{T}$ **:** The complex function $f(z) = \overline{z}$ is differentiable at $z = 0 + 0i$.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 6

Determine the validity of the statements:

S : The complex function $f(z) = i\sqrt[3]{xy}$ is differentiable at $z = 0 + 0i$.

T : The Cauchy-Riemann equations are satisfied at $z = 0$ for $f(z) = i\sqrt[3]{xy}$.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 7

Determine the validity of the statements:

S : The conjugate function has no derivative at any point.

T : The complex function $f(z) = |z|$ is not differentiable at any point.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 8

Determine the validity of the statements:

S : The complex function $\sin z$ is periodic.

T : The complex function $\sinh z$ is periodic.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 9

Determine the validity of the statements:

$\boldsymbol{S}$ **:** The complex function $\cosh z$ is not periodic.

$\boldsymbol{T}$ **:** The complex functions $\cosh z$ and $\sinh z$ are periodic with period 2π.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 10

Determine the validity of the statements:

S : The complex function $\cosh z$ is periodic.

T : The complex functions $\cosh z$ and $\sinh z$ are periodic with period $2\pi i$.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 11

Determine the validity of the statements:

$\boldsymbol{S}$ **:** $e^{z+2\pi} = e^z$ for all z.

$\boldsymbol{T}$ **:** $e^{z+2\pi i} = e^z$ for all z.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 12

How many values has the expression $\sqrt[n]{1}$, , where $n \in \mathbb{N}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 13

How many values has the expression 1^i?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 14

How many values has the expression $e^{2n\pi i}$, where $n \in \mathbb{N}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 15

How many values has the expression $\sqrt{1}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 16

How many values has the expression $e^{\pi i}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 17

Determine the validity of the statements:

S : The expression 1^i has at least one value greater than 2023.

T : The expression 1^i has a value less than $\frac{1}{10}$.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 18

Determine the validity of the statements:

S : The expression 1^i has an imaginary value.

T : The expression 1^i has a negative value.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 19

Determine the validity of the statements:

S : The expression $e^{2n\pi i}$ (where $n \in \mathbb{N}$) has at least one value greater than 2021.

T : The expression $e^{\pi i}$ has a positive real value.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 20

Determine the validity of the statements:

S : The equation $\sin z = a$ has solutions for $a = 2$.

T : The equation $\sin z = a$ has infinitely many solutions.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 21

The value of the integral

$$\oint_{|z-a|=1} \frac{dz}{z-a}$$

is

A. $2\pi i$

B. 0

C. a

D. None of the above.

Question 22

The value of the integral

$$\oint_{|z-a|=1} \frac{dz}{(z-a)^n},$$

if $n \neq 1$ $(n \in \mathbb{Z})$, is

A. $2\pi i$

B. 0

C. a

D. None of the above.

Question 23

The value of the integral

$$\oint_{|z|=1} \frac{z^2}{z-2}\, dz,$$

is

A. $2\pi i$

B. 0

C. $8\pi i$

D. $4\pi i$

Question 24

The value of the integral

$$\oint_{|z|=3} \frac{z^2}{z-2}\, dz,$$

is

A. $2\pi i$

B. 0

C. $8\pi i$

D. $4\pi i$

Question 25

The value of the integral

$$\oint_{|z|=1} \frac{\cos z}{z(z^2+8)}\, dz,$$

is

A. $2\pi i$

B. 0

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

D. $\frac{\pi i}{8}$