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Test 1 on AM1
2023

Question 1

Determine the validity of the statements:

S : The sequences $\left\{\frac{1}{n}\right\}$ is convergent.

T : The series $\sum \frac{1}{n}$ is convergent.

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 : If a finite number of terms are added to a convergent series, then the new series is still convergent.

T : If the number series $\sum_{n=1}^{\infty} a_n^2$ is convergent, then the series $\sum_{n=1}^{\infty} a_n \ \ (a_n \geq 0)$ is also convergent.

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 sequences $\left\{\frac{3n}{2n+1}\right\}$ is convergent.

T : The series $\sum \frac{3n}{2n+1}$ is convergent.

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:

$\boldsymbol{S}$ **:** If $\lim_{n\to\infty} a_n = 0$, then $\sum_{n=1}^{\infty} a_n$ is convergent.

$\boldsymbol{T}$ **:** If $\sum_{n=1}^{\infty} a_n$ is convergent, then $a_n \to 0$ for $n \to \infty$.

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:

$\boldsymbol{S}$ **:** If $0 \leq a_n \leq b_n$ and $\sum b_n$ diverges, then $\sum a_n$ diverges.

$\boldsymbol{T}$ **:** If $0 \leq a_n \leq b_n$ and $\sum a_n$ converges, then $\sum b_n$ converges.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 6

Let u_n be a general term of a series. Determine the validity of the statements:

$\boldsymbol{S}$ **:** If $\lim_{n\to\infty}(u_1 + u_2 + \ldots + u_n) = 5$, then $\lim_{n\to\infty} u_n = 0$.

$\boldsymbol{T}$ **:** If $\lim_{n\to\infty} u_n = 1$, then $\lim_{n\to\infty}(u_1 + u_2 + \ldots + u_n)$ exists and it is finite.

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 series $\sum_{n=0}^{\infty} 2^n$ is convergent.

T : The series $\sum_{n=0} (0.2)^n$ is convergent.

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 series $\sum \frac{\pi^n}{3^n}$ is convergent.

T : The series $\sum \pi^n$ is divergent.

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:

S : The series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is convergent.

T : The series $\sum \frac{1}{2^n}$ is convergent.

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 series $\sum n^3$ is convergent.

T : The series $\sum 3^n$ is convergent.

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:

S : The series $\sum_{n=1}^{\infty} \frac{1}{n(n+1)} = 1$.

T : The series $\sum_{n=1}^{\infty} \frac{1}{n} = 1$.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 12

Determine the validity of the statements:

S : If $\lim_{n\to\infty} a_n \neq 0$, then the series $\sum_{n=1}^{\infty} a_n$ is divergent.

T : If $\lim_{n\to\infty} a_n$ does not exist, then the series $\sum_{n=1}^{\infty} a_n$ is divergent.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 13

Determine the validity of the statements:

S : The series $\sum_{n=0}^{\infty} \left(\frac{22}{7\pi}\right)^n$ is convergent.

T : $\lim_{n\to\infty} \left(\frac{7\pi}{22}\right)^n \neq 0.$

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 14

Determine the validity of the statements:

S : The series $\sum_{n-1}^{\infty} e^{1/n}$ is convergent.

T : The series $\sum_{n=1}^{\infty} \left(\frac{1}{e}\right)^n$ is convergent.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 15

Determine the validity of the statements:

S : The series $\sum_{n=1}^{\infty} \sqrt[n]{3}$ is divergent.

T : The series $\sum_{n=1}^{\infty} \sqrt[3]{n}$ is divergent.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 16

Determine the validity of the statements:

S : The series $\sum_{n=1}^{\infty} \frac{1}{\sqrt[n]{3}}$ is convergent.

T : The series $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}$ is convergent.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 17

Determine the validity of the statements:

S : The series $\sum_{n=1}^{\infty} 3^n$ is divergent.

T : The series $\sum_{n=1}^{\infty} \frac{1}{3^n}$ is convergent.

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 series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is convergent.

T : The series $\sum_{n=1}^{\infty} \sin \frac{1}{n^2}$ is convergent.

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 series $\sum \frac{1}{n\sqrt{n}}$ is divergent.

T : The series $\sum \frac{1}{\sqrt{n}}$ is convergent.

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 series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+1}}$ is convergent.

T : The series $\sum \frac{\sqrt{n}}{\sqrt{n-1}}$ is convergent.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 21

Let u_n be a general term of a series. Determine the validity of the statements:

$\boldsymbol{S}$ **:** If $\lim_{n\to\infty}(u_1 + u_2 + \ldots + u_n) = 5$, then $\sum_{n=1}^{\infty} u_n = 5$.

$\boldsymbol{T}$ **:** If $\lim_{n\to\infty}(u_1 + u_2 + \ldots + u_n)$ exists and it is finite, then $\lim_{n\to\infty} u_n = 0$.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 22

Determine the validity of the statements:

S : The series $\sum_{n=0}^{\infty} \frac{3^n}{\pi^n}$ is divergent.

T : The series $\sum_{n=0}^{\infty} \frac{1}{3}$ is convergent.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 23

Determine the validity of the statements:

S : The series $\sum_{n=0}^{\infty} \left(\frac{1}{3^n} + \frac{1}{n^3} \right)$ is convergent.

T : The series $\sum_{n=0}^{\infty} \left(\frac{1}{n^5} + \frac{1}{3} \right)$ is convergent.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 24

Determine the validity of the statements:

$\boldsymbol{S}$ **:** If $\sum_{n=1}^{\infty} u_n = 25$, then $\lim_{n\to\infty} u_n = 25$.

$\boldsymbol{T}$ **:** If $\sum_{n=1}^{\infty} u_n = 25$, then $\lim_{n\to\infty} \sum_{k=1}^{n} u_k = 25$.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.

Question 25

Determine the validity of the statements:

S : The series $\sum_{n=0}^{\infty} \left(\frac{1}{25^n} - \frac{1}{n^{25}} \right)$ is divergent.

T : The series $\sum_{n=0}^{\infty} \left(\frac{1}{10^n} + \frac{1}{\sqrt[10]{n}} \right)$ is convergent.

A. S and T are true.

B. only S is true.

C. only T is true.

D. S and T are false.