1) If $s_n = \frac{(-1)^n}{2^n+3}$ and $t_n = \frac{(-1)^n}{4n-1}$, $n = 0, 1, 2, \dots$

Then.

a) $\sum_{n=0}^{\infty} s_n$ is absolutely convergent

b) $\sum_{n=0}^{\infty} t_n$ is absolutely convergent

c) $\sum_{n=0}^{\infty} s_n$ is conditionally convergent

d) $\sum_{n=0}^{\infty} t_n$ is conditionally convergent.

2) which one of the following series is divergent?

a) $\sum_{n=1}^{\infty} \frac{1}{n} \sin^2 \frac{1}{n}$ b) $\sum_{n=1}^{\infty} \frac{1}{n} \log n$.

c) $\sum_{n=1}^{\infty} \frac{1}{n^2} \sin \frac{1}{n}$ d) $\sum_{n=1}^{\infty} \frac{1}{n} \tan \frac{1}{n}$.

3) Suppose that S is the sum of a convergent series $\sum_{n=1}^{\infty} a_n$. Define $t_n = a_n + a_{n+1} + a_{n+2}$. Then the series $\sum_{n=1}^{\infty} t_n$?

a) diverges   b) converges to $3S - a_1 - a_2$

c) converges to $3S - a_1 - 2a_2$ d) converges to $3S - 2a_1 - a_2$.

4) The sum of the series $\sum_{n=2}^{\infty} \frac{(-1)^n}{n^2+n-2}$ is

a) $\frac{1}{3} \ln(2) - \frac{5}{18}$ b) $\frac{1}{3} \ln(3) - \frac{5}{6}$

c) $\frac{2}{3} \ln(2) - \frac{5}{18}$ d) $\frac{2}{3} \ln(2) - \frac{5}{6}$.

5) Let $a_n = e^{-2n} \sin n$ and $b_n = e^{-n} n^2 (\sin n)^2$ for $n \geq 1$, Then

a) $\sum_{n=1}^{\infty} a_n$ Converges but $\sum_{n=1}^{\infty} b_n$ does not converges.

b) $\sum_{n=1}^{\infty} b_n$ Converges but $\sum_{n=1}^{\infty} a_n$ does not converges

c) both $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ Converges

d) neither $\sum_{n=1}^{\infty} a_n$ Nor $\sum_{n=1}^{\infty} b_n$ converges.

6) For, $n \geq 1$ let $a_n = \begin{cases} n 2^{-n} & \text{if } n \text{ is odd} \\ -3^{-n} & \text{if } n \text{ is even.} \end{cases}$ which of the following statements is (are) True?

a) The Seqn $\{a_n\}$ converges b) The seq $\{|a_n|^{1/n}\}$ converges

c) The Series $\sum_{n=1}^{\infty} a_n$ Converges d) The series $\sum_{n=1}^{\infty} |a_n|$ converges.

7) Suppose $\{a_n\}$, $\{b_n\}$ are sequence such that $a_n > 0$, $b_n > 0$ for all $n \geq 1$. Given that $\sum a_n$ Converges and $\sum b_n$ diverges. Which of the following Statements is (are) necessarily False?

a) $\sum (a_n + b_n)$ converges b) $\sum \frac{a_n}{b_n}$ converges

c) $\sum \frac{b_n}{a_n}$ Converges d) $\sum a_n b_n$ converges.

8) Consider the series S_1 and S_2 given by.

$S_1 : \sum_{n=1}^{\infty} \frac{n^2+n+1}{n(n+1)}$ and $S_2 : \sum_{n=1}^{\infty} \frac{n^2+1}{n^2(n+1)}$ Then:

a) Both S_1 and S_2 converge   b) S_1 converges and S_2 diverges

c) S_2 converge and S_1 diverges   d) Both S_1 & S_2 diverges

9) let $u_n = (4 - 1/n)^{\frac{(-1)^n}{n}}$, $n \in \mathbb{N}$. and let $l = \lim_{n\to\infty} u_n$. which of the following staments is True?

a) $l = 0$ and $\sum_{n=1}^{\infty} u_n$ is convergent

b) $l = 1/4$ and $\sum_{n=1}^{\infty} u_n$ is divergent

c) $l = 1/4$ and $\{u_n\}_{n\geq 1}$ is oscillatory

d) $l = 1$ and $\sum_{n=1}^{\infty} u_n$ is divergent.

10) The series $\sum_{n=1}^{\infty} \frac{\log(1+\frac{1}{n})}{n^{\gamma}}$, Then

a) converges if $\gamma > 0$ b) converges $\forall \gamma \in \mathbb{R}$

c) converges if $\gamma = 0$ d) converges if $\gamma < 0$.

11) Let n be a fixed natural number. Then the series $\sum_{m\geq n} \frac{(-1)^m}{m}$ is.

a) Absolutely convergent   b) divergent

c) Absolutely convergent if $n > 100$ d) convergent.

12) Given $\{a_n\}, \{b_n\}$ two monotone sequences of real numbers and that $\Sigma a_n b_n$ is convergent, which of the following is true?

a) Σa_n is convergent and Σb_n is convergent.

b) Atleast one of $\Sigma a_n, \Sigma b_n$ is convergent.

c) $\{a_n\}$ is bdd and $\{b_n\}$ is bounded (bdd - bounded)

d) Atleast ~~of~~ of $\{a_n\}, \{b_n\}$ is bounded.

13) Which ~~of~~ of the following are convergent?

a) $\sum_{n=1}^{\infty} n^2 2^{-n}$ b) $\sum_{n=1}^{\infty} n^{-2} 2^n$.

c) $\sum_{n=2}^{\infty} \frac{1}{n \log n}$ d) $\sum_{n=1}^{\infty} \frac{1}{n \log(1+1/n)}$.

14) Let $\{a_n\}$ be sequence of real numbers. Which of the following is true?

a) If Σa_n converges, then so does Σa_n^2

b) If $\Sigma |a_n|$ converges, Then so does Σa_n^2

c) If $\Sigma |a_n|$ diverges then so does Σa_n^3

d) If $\Sigma |a_n|$ diverges then so does Σa_n^2

15) The value of the series $\sum_{n=1}^{\infty} \frac{n}{2^n}$ is

a) 1 b) 2 c) 3 d) 4.

16) The series $\sum_{n=1}^{x} \frac{\cos(3^n x)}{2^n}$, then

a) diverges; for all rational $x \in \mathbb{R}$

b) Diverges, for some irrational $x \in \mathbb{R}$

c) Converges; for some but not all $x \in \mathbb{R}$

d) converges for all $x \in \mathbb{R}$.

17) Let $\{x_n\}$ be a sequence of positive real numbers. Then which of the following is false?

a) if $\sum_{n=1}^{\infty} x_n$ is convergent then $\sum_{n=1}^{\infty} \sqrt{x_n}$ is convergent

b) if $\sum_{n=1}^{\infty} x_n$ is convergent then $\sum_{n=1}^{\infty} x_n^2$ is convergent.

c) if $\sum_{n=1}^{\infty} x_n^2$ is convergent then $\lim_{n\to\infty} x_n = 0$

d) if $\sum_{n=1}^{\infty} \sqrt{x_n}$ is convergent then $\lim_{n\to\infty} x_n = 0$.

18) The limit $\lim_{n\to\infty} \sum_{K=2}^{n} \frac{1}{K^3-K}$ is equal to ______.

19) for $a>0$ the series $\sum_{n=1}^{\infty} a^{\ln(n)}$ is convergent if and only if

a) $0<a<e$ b) $0<a\le e$

c) $0<a<1/e$ d) $0<a\le 1/e$

20) For $n\ge 2$, let $a_n=\frac{1}{n\log n}$. Then.

a) The sequence $\{a_n\}_{n=2}^{\infty}$ is convergent

b) The series $\sum_{n=2}^{\infty} a_n$ is convergent

c) The series $\sum_{n=2}^{\infty} a_n^2$ is convergent

d) The series $\sum_{n=2}^{\infty} (-1)^n a_n$ is convergent.