Insurgent

Infinite Series Practice Test
AP Calculus

Name:_____

For Questions 1-5, determine whether each series converges or diverges. Justify your answer.

(1) $\sum_{n=1}^{\infty} \frac{n^2}{n^3+1}$

(2) $\sum_{n=1}^{\infty} \frac{3n^3-n}{1-2n^3}$

(3) $\sum_{n=1}^{\infty} \frac{1}{n-\ln n}$

(4) $\sum_{n=0}^{\infty} \frac{2^{2n}}{n!}$

(5) $\sum_{n=1}^{\infty} \left(\frac{3}{4n}\right)^n$

(6) For what integer k, $k > 1$, will both $\sum_{n=1}^{\infty} \frac{(-1)^{kn}}{n}$ and $\sum_{n=1}^{\infty} \left(\frac{k}{4}\right)^n$ converge?

(A) 6

(B) 5

(C) 4

(D) 3

(E) 2

(7) Find the exact sum of $\sum_{n=0}^{\infty}\left[\left(\frac{2}{3}\right)^n - \frac{1}{(n+1)(n+2)}\right]$

(8) Which of the following series converge?

I. $\sum_{n=1}^{\infty}\frac{n}{n+2}$ II. $\sum_{n=1}^{\infty}\frac{\cos(\pi n)}{n}$ III. $\sum_{n=1}^{\infty}\frac{1}{n}$

(A) None (B) II only (C) III only (D) II and III only (E) I, II, and III

(9) Determine whether the series given below converges or diverges. If the series converges, define whether the series conditionally converges or absolutely converges. Justify your answer.

$$\sum_{n=1}^{\infty}\frac{(-1)^n\sqrt{n}}{n+1}$$

For Questions 10-12, determine whether each series converges or diverges. Justify your answer. If the series converges, find the exact summation or an interval of approximation using S_4.

(10) $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^{3/2}}$

(11) $\frac{4}{9} + \frac{8}{27} + \frac{16}{81} + \frac{32}{243} + \cdots$

(12) $\sum_{n=1}^{\infty} \frac{\cos(\pi n)}{n^{2/3}}$

(13) Find the smallest sum that will be accurate within 0.003 of the actual sum of $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} n}{n^4+5}$.

(14) If $\lim_{b\to\infty} \int_1^b \frac{dx}{x^p}$ is finite, then which of the following must be true?

(A) $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges (B) $\sum_{n=1}^{\infty} \frac{1}{n^p}$ diverges (C) $\sum_{n=1}^{\infty} \frac{1}{n^{p-2}}$ converges

(D) $\sum_{n=1}^{\infty} \frac{1}{n^{p-1}}$ converges (E) $\sum_{n=1}^{\infty} \frac{1}{n^{p+1}}$ diverges

(15) Using the Integral Test, prove whether the following converges or diverges. Justify your answer.

$$\sum_{n=1}^{\infty} ne^{-n}$$