

BC Calculus '18-19  
Numerical Series Test  
No Calculator Allowed

Name \_\_\_\_\_

Score \_\_\_\_\_.

1. Which of the following sequences diverge?

I.  $\left\{ \frac{4^n}{5^n} \right\}$

II.  $\left\{ \frac{4^n}{5n} \right\}$

III.  $\left\{ \frac{4n}{5n} \right\}$

(A) I only

(B) I and II only

(C) I and III only

(D) II and III only

(E) III only

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2. Which of the following series converge?

I.  $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$

II.  $\sum_{n=1}^{\infty} \frac{1}{n}$

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

(A) I only

(B) I and II only

(C) I and III only

(D) II and III only

(E) III only

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3. If  $a_n = \frac{2n^3 - 1}{3n^3 + 8}$ , which of the following converge?

I.  $\{a_n\}$

II.  $\sum_{n=1}^{\infty} a_n$

(A) I only

(B) II only

(C) Both I and II

(D) Neither I nor II

(E) Not enough information

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4. Which of these series converge absolutely?

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

II.  $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{1.5}}$

III.  $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{0.3}}$

(A) I only

(B) II only

(C) III only

(D) II and III only

(E) I, II, and III

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5. The geometric series  $\sum_{n=2}^{\infty} \frac{4^{n-1}}{7^n}$  is equal to:

- (A) 0      (B)  $\frac{4}{49}$       (C)  $\frac{4}{21}$       (D)  $\frac{4}{7}$       (E)  $\frac{7}{3}$
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6. Which of these tests will prove the convergence or divergence of

$$\sum_{k=1}^{\infty} \frac{2k^3}{k^4 + k^2}?$$

I. Direct comparison with  $\sum_{k=1}^{\infty} \frac{2}{k}$

II. Limit comparison with  $\sum_{k=1}^{\infty} \frac{1}{k}$

III. nth Term Test (Divergence Test)

(A) I only      (B) II only      (C) I and II only

(D) II and III only      (E) I, II, and III

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7. If  $\sum_{n=1}^{\infty} b_n$  is known to diverge, and  $a_n \leq b_n$  for all values of  $n$ , then we can conclude:

(A)  $\sum_{n=1}^{\infty} a_n$  converges

(B)  $\sum_{n=1}^{\infty} a_n$  diverges

(C)  $\sum_{n=1}^{\infty} b_n$  converges

(D)  $\lim_{n \rightarrow \infty} b_n = 0$

(E) No conclusion can be drawn from this information

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8. If  $f(x) = x^n$ , find the value of  $\sum_{n=2}^4 f(x)$  when  $x = 2$ .

(A)  $2^n$

(B)  $9 \cdot 2^n$

(C)  $9n^2$

(D) 28

(E) 31

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9. Which of the following limits will lead to a conclusion for a series test?

I.  $\lim_{n \rightarrow \infty} a_n = 0$

II.  $\lim_{n \rightarrow \infty} \frac{a_{n+1}}{a_n} = 0$

III.  $\lim_{n \rightarrow \infty} \frac{a_n}{b_n} = 0$

(A) I only

(B) II only

(C) I and III only

(D) II and III only

(E) I, II, and III

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10. If  $f(x) = \sum_{n=0}^{\infty} \left( \frac{3}{2} - \sec x \right)^n$ , then  $f\left(\frac{\pi}{3}\right) =$

(A) 2      (B)  $\frac{2}{3}$       (C)  $-\frac{1}{3}$       (D)  $\frac{3}{2}$       (E) divergent

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1. Use the Integral Test to determine if  $\sum_{n=2}^{\infty} \frac{n^2}{\sqrt{n^3+1}}$  is convergent or divergent.

2. Does the series  $\sum_{n=2}^{\infty} \frac{\cos(\pi n)}{\sqrt{n}}$  diverge, converge conditionally, or converge absolutely? Show the work that leads to your conclusion.

3. Use the Ratio Test to determine if  $\sum_{n=1}^{\infty} \frac{n2^n}{n!}$  is convergent or divergent.

4. Determine whether  $\sum_{n=1}^{\infty} \frac{4^n - 1}{6^n}$  converges or diverges. Explain your reasoning.