

1. Determine the limit of the sequence $a_n = \frac{(n+1)!}{n!}$

- a) 2 b) 3 c) $\frac{1}{3}$ d) $\frac{1}{2}$ e) Divergent

2. Which of the following sequences diverge?

I. $\left\{ \frac{3n^5}{7n^4 - 1} \right\}$ II. $\left\{ \frac{\cos n}{\pi^n} \right\}$ III. $\left\{ \frac{n!}{e^{2n}} \right\}$

- (A) I only (B) II only (C) I and III only
(D) II and III only (E) III only

3. Which of the following series diverge?

I. $\sum_{n=1}^{\infty} \frac{1}{n^4}$ II. $\sum_{n=3}^{\infty} \frac{n^2}{2n^2 + 1}$ III. $\sum_{n=1}^{\infty} (\sqrt{2})^n$
(A) I only (B) II only (C) I and II only
(D) II and III only (E) I, II, and III

4. Which of the following series converge?

- I. $\sum_{n=1}^{\infty} \frac{n}{n+1}$ II. $\sum_{n=3}^{\infty} \frac{\pi^n}{3^n}$ III. $\sum_{n=1}^{\infty} \frac{1}{n\sqrt{n}}$
- (A) I only (B) II only (C) III only
- (D) II and III only (E) I, II, and III

5. Which of the following series converge?

- I. $\sum_{n=1}^{\infty} \frac{1}{(n+1)^3}$ II. $\sum_{n=2}^{\infty} \frac{2^n 3^{n+1}}{(2e)^n}$ III. $\sum_{n=1}^{\infty} \frac{n+1}{\sqrt{n^3+2}}$
- (A) I only (B) II only (C) I and II only
- (D) I and III only (E) I, II, and III

6. Which of the following three tests will establish that the series $\sum_{n=1}^{\infty} \frac{3}{n(n+2)}$ converges?

I. Direct Comparison to $\sum_{n=1}^{\infty} 3n^{-2}$

II. Limit Comparison to $\sum_{n=1}^{\infty} n^{-2}$

III. Direct Comparison to $\sum_{n=1}^{\infty} 3n^{-1}$

(A) I only

(B) II only

(C) I and II only

(D) I and III only

(E) I, II, and III

7. If $f(x) = \sum_{n=1}^{\infty} \left((1 - \cos x)^2 \right)^n$, then $f\left(\frac{2\pi}{3}\right) =$

(A) 2 (B) $\frac{4}{3}$ (C) $\frac{1}{2}$ (D) $\frac{3}{2}$ (E) divergent

8. Which of the following series is/are absolutely convergent?

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

- (A) I only (B) II only (C) I and III only
(D) II and III only (E) I, II, and III

9. Which of the following series is/are convergent?

I. $\sum_{n=1}^{\infty} \frac{1}{n^{-0.9}}$ II. $\sum_{n=1}^{\infty} \frac{3^n}{n+5^n}$ III. $\sum_{n=1}^{\infty} \frac{n}{1+4n}$

- (A) I only (B) II only (C) I and II only
(D) II and III only (E) I, II, and III

10. For what values of k do both $\sum_{n=1}^{\infty} \frac{(-1)^{kn}}{n^2}$ and $\sum_{n=1}^{\infty} \left(\frac{k}{3}\right)^n$ converges?

- (A) 2
(B) 3
(C) 4
(D) 5
(E) All real values of k

BC Calculus '16-17
Numerical Series Quiz

Name _____

1. Use the Integral Test to determine if $\sum_{n=3}^{\infty} \frac{3n}{n^2 - 4}$ is convergent or divergent.

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