Name: _____ Date: _____ Period: _____

## BC Calculus Unit 10 "Tests for Convergence" Review WS #3

Calculators Allowed:

1) The infinite series $\sum_{n=1}^{\infty} \frac{3}{4^{n+1}}$ has $n$th partial sum $S_n = \frac{1}{4} - \frac{1}{4^{n+1}}$. What is the sum of the series?

**Use the $n$th-Term Test for Divergence to determine if the series diverges.**

2. $\sum_{n=0}^{\infty} \frac{\pi^{n+1}}{7^n}$

3. $\sum_{n=1}^{\infty} \frac{2(n-2)^2}{3(n+4)^2}$

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

5) If the infinite series $\sum_{n=1}^{\infty} a^n$ has $n$th partial sum $S_n = \frac{4}{3}(4^n - 1)$ for $n \geq 1$. What is the sum of the series?

6) Does the series $\sum_{n=1}^{\infty} \left(\frac{1}{2n-1} - \frac{1}{2n+1}\right)$ converge or diverge? If it converges find its sum.

7) What is the sum of the infinite geometric series $11 + -\frac{11}{3} + \frac{11}{9} + -\frac{11}{27} + \cdots$ ?

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8) What is the value of $\sum_{n=1}^{\infty} \frac{(-e)^{n+1}}{9^n}$ ?

9) For what value of $a$ does the infinite series $\sum_{n=0}^{\infty} a\left(-\frac{3}{5}\right)^n$ equal 15?

10) The $n$th-Term Test can be used to determine divergence for which of the following series?

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

A. III only

B. I and III only

C. II and III only

D. I, II, and III

11) Verify that the infinite series $\sum_{n=1}^{\infty} \frac{6^n+1}{6^{n+1}}$ diverges by using the $n$th-Term Test for Divergence. Show the value of the limit.

12) Use the Integral Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{1}{n^5}$.

13) Prove the Integral Test applies to the series $\sum_{n=1} \frac{1}{(n+1)^3}$. Determine the convergence or divergence of the series.

14) Use the Integral Test to determine if the series $\sum_{n=1}^{\infty} \frac{4n}{2n^2+1}$ converges or diverges.

15) For what values of $p$ will the infinite series $\sum_{n=1}^{\infty} \frac{1}{n^{1-p}}$ converge?

16) For what values of $p$ will both infinite series $\sum_{n=1}^{\infty} \left(\frac{3}{p}\right)^n$ and $\sum_{n=1}^{\infty} \frac{1}{n^{5-p}}$ converge?

17) Which of the following is a divergent $p$-series?

A. $\sum_{n=1}^{\infty} n^{-\pi}$ B. $\sum_{n=1}^{\infty} \frac{1}{n}$ C. $\sum_{n=1}^{\infty} \left(\frac{e}{\pi}\right)^n$ D. $\sum_{n=1}^{\infty} \frac{1}{n^3}$

18) Which of the following series converges?

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

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

(C) $\sum_{n=1}^{\infty} \left(\frac{\pi}{e}\right)^n$

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

(E) $\sum_{n=1}^{\infty} \frac{n-1}{n4^n}$

19) Which of the following series can be used with the Limit Comparison Test to determine whether the series $\sum_{n=1}^{\infty} \frac{5^n}{7^n - n^2}$ diverges or converges?

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

(B) $\sum_{n=1}^{\infty} \frac{1}{5^n}$

(C) $\sum_{n=1}^{\infty} \frac{1}{7^n}$

(D) $\sum_{n=1}^{\infty} \left(\frac{5}{7}\right)^n$

20) Use the Comparison Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{n-2}{n5^n}$. You must identify the series you are using for comparison.

21) Determine whether the series $\sum_{n=1}^{\infty} \frac{n5^n}{4n^4-3}$ converges or diverges. Identify the test for convergence used.

22) Explain why the Alternating Series Test does not apply to the series $\sum_{n=1}^{\infty} \frac{(-1)^n \cos(n\pi)}{n^2}$.

23) Determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{(-1)^n n}{\ln(n+1)}$.

24) Which of the following series converge?

I. $\sum_{n=1}^{\infty} \frac{(-1)^n}{4^n}$ II. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\pi^n}$ III. $\sum_{n=1}^{\infty} \frac{(-1)^n n^2}{1+n^2}$

A. I only B. I and II only C. I and III only D. I, II, and III

25) Which of the following statements is true?

A. $\sum_{n=1}^{\infty} \frac{(-1)^n (1-n)}{n}$ converges by the Alternating Series Test.

B. $\sum_{n=1}^{\infty} \frac{(-1)^n (n+1)}{2n}$ converges by the Alternating Series Test.

C. $\sum_{n=1}^{\infty} \frac{(-1)^n n^2}{4\sqrt{n}}$ converges by the Alternating Series Test.

D. $\sum_{n=1}^{\infty} \frac{(-1)^n 2\sqrt{n}}{n}$ converges by the Alternating Series Test.

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26) Use the Ratio Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{n^4}{3^n}$.

27) If the Ratio Test is applied to the series $\sum_{n=0}^{\infty} \frac{6^n}{(n+1)^n}$, which of the following inequalities results, implying that the series converges?

A. $\lim_{n\to\infty} \frac{6^n}{(n+1)^n} < 1$ B. $\lim_{n\to\infty} \frac{6(n+1)^n}{(n+2)^{n+1}} < 1$ C. $\lim_{n\to\infty} \frac{6^{n+1}}{(n+1)^n} < 1$ D. $\lim_{n\to\infty} \frac{6^{n+1}}{(n+1)^{n+1}} < 1$

28) If $a_n > 0$ for all $n$ and $\lim_{n\to\infty} \frac{a_{n+1}}{a_n} = 5$, which of the following series converges?

A. $\sum_{n=1}^{\infty} \frac{a_n}{n^2}$ B. $\sum_{n=1}^{\infty} \frac{a_n}{2^n}$ C. $\sum_{n=1}^{\infty} \frac{a_n}{n^5}$ D. $\sum_{n=1}^{\infty} \frac{a_n}{7^n}$

29) What are all values of $x > 0$ for which the series $\sum_{n=1}^{\infty} \frac{6n^3}{x^n}$ converges?

30) Which of the following series converge?

I. $\sum_{n!}^{\infty} \frac{1}{n!}$ II. $\sum_{n^5}^{\infty} \frac{9^n}{n^5}$ III. $\sum_{2n-1}^{\infty} \frac{5n}{2n-1}$

A. I only B. I and II only C. I and III only D. I, II, and III

31) For what values of $x$ is the series $\sum_{n=0}^{\infty}(-1)^n(5x+1)^n$ absolutely convergent?

32) For what values of $x$ is the series $\sum_{n=1}^{\infty}\frac{(5x-2)^n}{n}$ conditionally convergent?

A. $x > \frac{3}{5}$ B. $x = \frac{3}{5}$ C. $x = \frac{1}{5}$ D. $x < \frac{1}{5}$

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33) Which of the following statements is true about the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2\sqrt{n}}$.

A. The series converges conditionally.

B. The series converges absolutely.

C. The series converges but neither conditionally nor absolutely.

D. The series diverges.

34) Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n+5}$ converges absolutely, converges conditionally, or diverges.

35) Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(n+1)!}$ converges absolutely, converges conditionally, or diverges.