MA 16200
EXAM 3 Form 01
November 14, 2019

NAME ____________________ YOUR TA'S NAME ____________________

STUDENT ID # ____________________ RECITATION TIME ____________________

Be sure the paper you are looking at right now is GREEN! Write the following in the TEST/QUIZ NUMBER boxes (and blacken in the appropriate spaces below the boxes): $\boxed{\textbf{01}}$

You must use a #2 pencil on the mark–sense sheet (answer sheet). On the mark–sense sheet, fill in your TA's name and the COURSE number. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces. Fill in your four-digit SECTION NUMBER. If you do not know your section number, ask your TA. Sign the mark–sense sheet.

There are **12** questions, each worth 8 points (you will automatically earn 4 point for taking the exam). Blacken in your choice of the correct answer in the spaces provided for questions 1–12. Do all your work in this exam booklet. Use the back of the test pages for scrap paper. Turn in both the scantron and the exam booklet when you are finished.

If you finish the exam before 7:20, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 6:50. If you don't finish before 7:20, you MUST REMAIN SEATED until your TA comes and collects your scantron sheet and your exam booklet.

EXAM POLICIES

1. Students may not open the exam until instructed to do so.
2. Students must obey the orders and requests by all proctors, TAs, and lecturers.
3. No student may leave in the first 20 min or in the last 10 min of the exam.
4. Books, notes, calculators, or any electronic devices are not allowed on the exam, and they should not even be in sight in the exam room. Students may not look at anybody else's test, and may not communicate with anybody else except, if they have a question, with their TA or lecturer.
5. After time is called, the students have to put down all writing instruments and remain in their seats, while the TAs will collect the scantrons and the exams.
6. Any violation of these rules and any act of academic dishonesty may result in severe penalties. Additionally, all violators will be reported to the Office of the Dean of Students.

I have read and understand the exam rules stated above:

STUDENT NAME: ____________________

STUDENT SIGNATURE: ____________________

1. Determine if the geometric series converges. If it converges, find its sum.

$$1 + 1/5 + (1/5)^2 + (1/5)^3 + \cdots$$

A. Converges to 7/4.

B. Converges to 2.

C. Converges to 5/4.

D. Converges to 9/4.

E. Diverges.

2. Determine if the telescoping series converges. If it converges, find its sum.

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

A. Converges to 3/2.

B. Converges to 5/12.

C. Converges to 5/6.

D. Converges to 5/2.

E. Diverges.

3. Which statement is true for the series $\displaystyle\sum_{m=1}^{\infty} \frac{2^{-m}}{\cos(m)+2}$?

A. Diverges by comparison test with $\displaystyle\sum_{m=1}^{\infty} \frac{1}{\cos(m)+2}$.

B. Diverges by comparison test with $\displaystyle\sum_{m=1}^{\infty} 2^{-m}$.

C. Converges by comparison test with $\displaystyle\sum_{m=1}^{\infty} \frac{1}{\cos(m)+2}$.

D. The comparison test is not applicable.

E. Converges by comparison test with $\displaystyle\sum_{m=1}^{\infty} 2^{-m}$.

4. Which of the following series converge?

$$I.\ \sum_{k=1}^{\infty} \frac{1}{2k-1}; \quad II.\ \sum_{k=1}^{\infty} (-1)^{k-1} \frac{1}{\sqrt{k}+1}; \quad III.\ \sum_{k=1}^{\infty} \frac{1}{k^2+1}$$

A. All three

B. I and II

C. Only III

D. II and III

E. None

5. Consider $S = \sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^7}$ and its partial sum S_n. What is the smallest number n such that $|S - S_n|$ is guaranteed by the Alternating Series Estimation Theorem to be **less than or equal to** 6^{-7} ?

A. 4

B. 5

C. 6

D. 7

E. 8

6. Which of the following statements is FALSE?

A. $\sum_{n=1}^{\infty} \frac{n^3}{r^n}$ converges for all $|r| > 1$.

B. If $0 \leq a_n \leq b_n$ and $\sum_{n=1}^{\infty} a_n$ is convergent, then $\sum_{n=1}^{\infty} b_n$ is also convergent.

C. If $0 \leq a_n \leq b_n$ and $\sum_{n=1}^{\infty} a_n$ is divergent, then $\sum_{n=1}^{\infty} b_n$ is also divergent.

D. $\sum_{n=1}^{\infty} \frac{1}{n^p + n}$ is convergent for all $p > 1$.

E. $\sum_{n=1}^{\infty} r^n$ diverges for all $|r| \geq 1$.

7. For which of the following series is the Ratio Test inconclusive?

I. $\displaystyle\sum_{n=101}^{\infty} \frac{n}{e^{n+1}}$

II. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n \sin(9n)}{n^2}$

III. $\displaystyle\sum_{n=1}^{\infty} \frac{13^n}{2^{n^2}}$

A. II and III only

B. II only

C. III only

D. All of them

E. None of them

8. For which values of c is $\displaystyle\sum_{n=1}^{\infty} \left(1 + \frac{c^2}{n}\right)^n$ convergent?

A. All values of c.

B. $|c| < 1$.

C. $|c| < 2$.

D. $|c| > 2$.

E. No values of c.

9. Use a second-order Taylor Polynomial for $f(x) = \cos^2 x$ centered at $x = a = 0$ to estimate $f\left(\frac{\pi}{6}\right)$

A. $1 - \frac{\pi^2}{36}$

B. $1 - \frac{\pi^2}{18}$

C. $1 - \frac{\pi}{3}$

D. 1

E. $\frac{3}{4}$

10. A second-order Taylor Polynomial for $f(x) = \frac{1}{x}$ centered at $x = a = 1$ is used to estimate the value of $\frac{1}{1.1}$. What is its remainder? In the answers below, c is some number between 1 and 1.1.

A. $\frac{-(0.1)^3}{c^4}$

B. $\frac{(0.1)^2}{c^3}$

C. $\frac{(1.1)^3}{c^4}$

D. $\frac{(0.1)^3}{c^3}$

E. $\frac{-(1.1)^3}{c^4}$

11. Find the radius of convergence.

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

A. 0

B. 1

C. 2

D. 3

E. ∞

12. Find the interval of convergence of $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{n+4}$

A. $[-1, 1)$

B. $[-1, 1]$

C. $(-1, 1]$

D. $(-1, 1)$

E. Converges everywhere