MA 16200
EXAM 3 INSTRUCTIONS
VERSION 01
April 12, 2022

Your name _____ Your TA's name _____

Student ID # _____ Section # and recitation time _____

1. You must use a #2 pencil on the scantron sheet (answer sheet).

2. Check that the cover of your exam booklet is GREEN and that it has VERSION 01 on the top. Write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below.

3. On the scantron sheet, fill in your **TA's name (NOT the lecturer's name)** and the course number.

4. Fill in your NAME and PURDUE ID NUMBER, and blacken in the appropriate spaces.

5. Fill in the four-digit **SECTION NUMBER**.

6. Sign the scantron sheet.

7. Blacken your choice of the correct answer in the space provided for each of the questions 1–12. While mark all your work on the scantron sheet, you should show your work on the exam booklet. Although no partial credit will be given, any disputes about the grade or grading will be settled by examining your written work on the exam booklet.

8. There are 12 questions, each worth 8 points (you will automatically earn 4 point for taking the exam).The maximum possible score is 100 points.

9. NO calculators, electronic device, books, or papers are allowed. Use the back of the test pages for scrap paper.

10. After you finish the exam, turn in BOTH the scantron sheet and the exam booklet.

11. If you finish the exam before 7:25, you may leave the room after turning in the scantron sheets and the exam booklets. If you don't finish before 7:25, you should REMAIN SEATED until your TA comes and collects your scantron sheet and exam booklet.

Exam Policies

1. Students must take pre-assigned seats and/or follow TAs' seating instructions..
2. Students may not open the exam until instructed to do so.
3. No student may leave in the first 20 min or in the last 5 min of the exam.
4. Students late for more than 20 min will not be allowed to take the exam; they will have to contact their lecturer within one day for permission to take a make-up exam.
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 scantron sheet and the exam booklet.
6. Any violation of the above rules may result in score of zero.

Rules Regarding Academic Dishonesty

1. You are not allowed to seek or obtain any kind of help from anyone to answer questions on the exam. If you have questions, consult only your instructor.
2. You are not allowed to look at the exam of another student. You may not compare answers with anyone else or consult another student until after you have finished your exam, handed it in to your instructor and left the room.
3. You may not consult notes, books, calculators. You may not handle cell phones or cameras, or any electronic devices until after you have finished your exam, handed it in to your instructor and left the room.
4. Anyone who violates these instructions will have committed an act of academic dishonesty. Penalties for academic dishonesty can be very severe and may include an F in the course. All cases of academic dishonesty will be reported immediately to the Office of the Dean of Students.

I have read and understand the exam policies and the rules regarding the academic dishonesty stated above:

STUDENT NAME: _____

STUDENT SIGNATURE: _____

1. Suppose $b_n > 0$ for each n and $\lim_{n\to\infty}\left(\frac{b_{n+1}}{b_n}\right) = \frac{1}{3}$.

We know that the series $\sum_{n=0}^{\infty}(-1)^n b_n$

A. must be absolutely convergent.

B. must be divergent.

C. must be conditionally convergent.

D. converges or diverges; the given information is inconclusive.

2. Assume that the alternating series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}$ converges to $\ln 2$. For which n is the following true?

$$\left|\ln(2) - \left(1 - \tfrac{1}{2} + \tfrac{1}{3} - \tfrac{1}{4} + \tfrac{1}{5} - \tfrac{1}{6} + ... + \tfrac{(-1)^{n+1}}{n}\right)\right| \leq 0.01$$

A. $n \geq 11$

B. $n \geq 10$

C. $n \geq 27$

D. $n \geq 99$

E. $n \geq 9$

3. The Ratio Test for the series $\sum_{k=1}^{\infty} \frac{(k!)^2}{(2k)!}$ gives a resulting limit of

A. $r < 1$ and therefore the series diverges.

B. $r = 1$ and the series diverges.

C. $r < 1$ and therefore the series converges.

D. $r > 1$ and therefore the series diverges.

E. $r = 1$ and the series converges.

4. Which of the following statements are true?

I). If the sequence $a_1, a_2, a_3, ...$ converges, then the series $a_1 + a_2 + a_3 + ...$ converges.

II). If the sequence $a_1, a_2, a_3, ...$ diverges, then the series $a_1 + a_2 + a_3 + ...$ diverges.

III). If the series $a_1 + a_2 + a_3 + ...$ converges, then the sequence $a_1, a_2, a_3, ...$ converges.

IV). If the series $a_1 + a_2 + a_3 + ...$ diverges, then the sequence $a_1, a_2, a_3, ...$ diverges.

A. (I) and (IV)

B. (II) and (III)

C. (III) and (IV)

D. (II) and (IV)

E. (I) and (II)

5. What is the interval of convergence of the series

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

A. $[0, 1)$

B. $[0, 2]$

C. $[0, 1]$

D. $(0, 1]$

E. $[0, 2)$

6. For which of the following series the ratio test is inconclusive?

I). $\sum_{k=1}^{\infty} \frac{10^k}{k!}$

II). $\sum_{k=1}^{\infty} \frac{1}{k^2}$

III). $\sum_{k=1}^{\infty} \frac{\ln k}{k}$

A. I only

B. II only

C. III only

D. I and II

E. II and III

7. Determine whether the following series are absolutely convergent, conditionally convergent, or divergent:
(I) $\sum_{n=1}^{\infty} \frac{\cos(n)}{n^2+1}$
(II) $\sum_{n=1}^{\infty} \frac{(-1)^n}{2n}$

A. I is absolutely convergent; II is divergent.

B. I is conditionally convergent; II is divergent.

C. I is absolutely convergent; II is conditionally convergent.

D. I is divergent; II is conditionally convergent.

E. I and II are conditionally convergent.

8. Evaluate $5 - \frac{10}{3} + \frac{20}{9} - \frac{40}{27} + \frac{80}{81} - \frac{160}{243} + ...$

A. 3

B. 5/3

C. 15

D. 10

E. 10/3

9. If $f(0) = 0$, $f'(0) = 7$, $f''(0) = 0$, and $f'''(0) = 2$ then which of the following is the third order Taylor polynomial generated by $f(x)$ at center $a = 0$?

A. $\frac{1}{3}x^3 + 7x$

B. $2x^3 + x$

C. $\frac{2}{3}x^3 + \frac{1}{2}x$

D. $2x^3 - x$

E. $\frac{1}{3}x^3 + \frac{1}{7}x$

10. The series $\sum_{k=0}^{\infty} k^2 e^{-k^3}$ is

A. divergent by comparison with $\sum_{k=1}^{\infty} \frac{1}{k}$

B. divergent by comparison with $\sum_{k=1}^{\infty} \frac{\ln k}{k}$

C. divergent by integral test

D. convergent by integral test

E. a convergent geometric series.

11. Find the remainder term, $R_n(x)$, in the n-th order Taylor polynomial centered at $a = 2$ for the function $f(x) = e^{-3x}$. In the choices below c is some number between x and 2.

A. $R_n(x) = \frac{(-3)^n e^{-3c}}{(n+1)!}(x-2)^{n+1}$

B. $R_n(x) = \frac{(-3)^n e^{-3c}}{(n+1)!}(x-2)^{n}$

C. $R_n(x) = \frac{(-3)^{(n+1)} e^{-3c}}{(n+1)!}(x-2)^{n+1}$

D. $R_n(x) = \frac{(-3)^{(n+1)} e^{3c}}{(n+1)!}(x-2)^{n+1}$

E. $R_n(x) = \frac{(-3)^{(n+1)} e^{3c}}{(n+1)!}(x-2)^{n}$

12. Use the power series $f(x) = \ln(1-x) = -\sum_{k=1}^{\infty} \frac{x^k}{k}$, for $-1 \leq x < 1$, to find the power series representation for the function $p(x) = 5x^6 \ln(1-x)$ centered at $a = 0$.

A. $-5\sum_{k=1}^{\infty} \frac{x^{6k}}{k}$

B. $-5\sum_{k=1}^{\infty} \frac{x^{6+k}}{k}$

C. $-6\sum_{k=1}^{\infty} \frac{x^{5k}}{k}$

D. $-5\sum_{k=1}^{\infty} \frac{x^{5k}}{6k}$

E. $-6\sum_{k=1}^{\infty} \frac{x^{6k}}{k}$