MA 16200
EXAM 3 Form A
April 14, 2016

NAME ____________________ YOUR TA'S NAME ____________________

STUDENT ID # ____________________ RECITATION TIME ____________________

1. You must use a #2 pencil on the mark–sense sheet (answer sheet).

2. If the cover of your question booklet is GREEN, write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below. If the cover is ORANGE, write 02 in the TEST/QUIZ NUMBER boxes and darken the spaces below.

3. On the mark-sense sheet, fill in your TA's name and the course number.

4. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces.

5. Fill in your four-digit SECTION NUMBER. If you do not know your section number, please ask your TA.

6. Sign the mark–sense sheet.

7. Fill in your name and your instructor's name on the question sheets above.

8. There are 12 questions, each worth 8 points (you will automatically earn 4 points for taking the exam). Blacken in your choice of the correct answer in the spaces provided for questions 1–12. Do all your work on the question sheets.

9. Turn in both the mark–sense sheets and the question sheets when you are finished.

10. If you finish the exam before 7:20, you may leave the room after turning in the scantron sheet and the exam booklet. 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.

11. NO CALCULATORS, PHONES, BOOKS, OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.

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. Find the sum of $\displaystyle\sum_{n=0}^{\infty} \frac{2^n + (-1)^{n+1}}{3^n}$

A. $\dfrac{9}{5}$

B. $\dfrac{7}{3}$

C. $\dfrac{7}{4}$

D. $\dfrac{4}{5}$

E. $\dfrac{9}{4}$

2. Which statements are true about $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{2n^2-1}}$?

I. Using $\displaystyle\sum_{n=1}^{\infty} b_n = \sum_{n=1}^{\infty} \frac{1}{2n}$, the Limit Comparison Test implies the series converges.

II. Using $\displaystyle\sum_{n=1}^{\infty} b_n = \sum_{n=1}^{\infty} \frac{1}{2n}$, the Limit Comparison Test implies the series diverges.

III. Using $\displaystyle\sum_{n=1}^{\infty} b_n = \sum_{n=1}^{\infty} \frac{1}{2n}$, the (ordinary) Comparison Test implies the series converges.

IV. Using $\displaystyle\sum_{n=1}^{\infty} b_n = \sum_{n=1}^{\infty} \frac{1}{2n}$, the (ordinary) Comparison Test implies the series diverges.

A. I and III

B. II and IV

C. IV only

D. III only

E. II only

3. Which of the following series converge?

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

II. $\displaystyle\sum_{n=1}^{\infty} \frac{\cos^2 n}{n^2+1}$

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

A. II only

B. I only

C. I and II

D. II and III

E. All of them

4. Which of the following series converge?

I. $\displaystyle\sum_{n=1}^{\infty} \frac{2^n+1}{3^n+1}$

II. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{(\sqrt{n}+1)^2}$

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

A. I only

B. I and III

C. III only

D. I and II

E. All of them

5. What does the Alternating Series Estimation Theorem predict about how many terms of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ you need to add to find the sum with an error of no more than 0.01?

A. 7 terms

B. 8 terms

C. 9 terms

D. 10 terms

E. 11 terms

6. For which of these series does the ratio test show convergence?

$$\text{I.} \quad \sum_{n=1}^{\infty} \frac{e^{n^2}}{n!}$$

$$\text{II.} \quad \sum_{n=1}^{\infty} \frac{1}{n^2+1}$$

$$\text{III.} \quad \sum_{n=1}^{\infty} \frac{10^n}{n^{10}}$$

A. I only

B. II only

C. III only

D. None of them

E. All of them

7. Which of these series converge conditionally?

$$\text{I.}\quad \sum_{n=1}^{\infty}(-1)^n\frac{n^2}{2^n}$$
$$\text{II.}\quad \sum_{n=1}^{\infty}(-1)^n\frac{1}{(3n+1)^2}$$
$$\text{III.}\quad \sum_{n=1}^{\infty}(-1)^n n\sin\left(\frac{1}{n}\right)$$

A. I only

B. II only

C. III only

D. None of them

E. All of them

8. Find the radius of convergence.

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

A. 0

B. 1

C. 2

D. 3

E. ∞

9. Find the coefficient of the x^3 term in the power series representation of $f(x) = \dfrac{x}{9+x}$

A. $\dfrac{1}{9^3}$

B. $\dfrac{-1}{9^3}$

C. $\dfrac{1}{9^4}$

D. $\dfrac{-1}{9^4}$

E. 1

10. The Maclaurin series of $f(x)$ is $\displaystyle\sum_{n=1}^{\infty} \frac{1}{2n-1} x^{2n-1}$. Find the fifth derivative of $f(x)$ at $x = 0$.

A. 3!

B. 4!

C. 5!

D. 6!

E. 7!

11. Use the fact that $e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$ to find the Maclaurin series of $\int \frac{e^x - 1}{x}\, dx$.

A. $C + \sum_{n=1}^{\infty} \frac{x^n}{n \cdot n!}$

B. $C + \sum_{n=1}^{\infty} \frac{x^{n+1}}{(n+1)(n+1)!}$

C. $C + \sum_{n=1}^{\infty} \frac{x^{n+1}}{n!}$

D. $C + \sum_{n=1}^{\infty} \frac{x^{n+1}}{(n+1)n!}$

E. $C + \sum_{n=1}^{\infty} \frac{x^n}{n(n+1)!}$

12. The binomial series is

$$(1+x)^k = \sum_{n=0}^{\infty} \binom{k}{n} x^n = 1 + kx + \frac{k(k-1)}{2!}x^2 + \frac{k(k-1)(k-2)}{3!}x^3 + ...$$

What is the Maclaurin series of $f(x) = \frac{1}{(1+x)^3}$?

A. $\sum_{n=0}^{\infty} \frac{(-1)^n (n+1)n}{2} x^n$

B. $\sum_{n=0}^{\infty} \frac{(-1)^n (n+2)(n+1)}{2} x^{n+1}$

C. $\sum_{n=0}^{\infty} \frac{(-1)^n (n+1)n}{2} x^{n+1}$

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

E. $\sum_{n=0}^{\infty} \frac{(-1)^n (n+2)(n+1)}{2} x^n$