MA 166 Exam 3 01 Spring 2012

NAME ______________________________

10-DIGIT PUID ______________________________

REC. INSTR. ______________ REC. TIME ______________

LECTURER ______________________________

INSTRUCTIONS:

1. There are 7 different test pages (including this cover page). Make sure you have a complete test.
2. Fill in the above items in print. Also write your name at the top of pages 2–7.
3. Do any necessary work for each problem on the space provided or on the back of the pages of this test booklet. Circle your answers in this test booklet. No partial credit will be given, but if you show your work on the test booklet, it may be used in borderline cases.
4. No books, notes, calculators or any electronic devices may be used on this exam.
5. Each problem has its own points assigned. The maximum possible score is 100 points.
6. Using a #2 pencil, fill in each of the following items on your scantron sheet:
   (a) On the top left side, write your name (last name, first name), and fill in the little circles.
   (b) On the bottom left side, under SECTION NUMBER, put 0 in the first column and then enter the 3-digit section number. For example, for section 016 write 0016. Fill in the little circles.
   (c) On the bottom, under TEST/QUIZ NUMBER, write 01 and fill in the little circles.
   (d) On the bottom, under STUDENT IDENTIFICATION NUMBER, write in your 10–digit PUID, and fill in the little circles.
   (e) Using a #2 pencil, put your answers to questions 1–12 on your answer sheet by filling in the circle of the letter of your response. Double check that you have filled in the circles you intended. If more than one circle is filled in for any question, your response will be considered incorrect. Use a #2 pencil.
7. After you have finished the exam, hand in your scantron sheet and your test booklet to your recitation instructor.

1. Compute the geometric series:

$$L = 4 - \frac{8}{3} + \frac{16}{9} - \frac{32}{27} + \cdots$$

A. 4

B. $\frac{12}{5}$

C. $\frac{24}{5}$

D. 12

E. $\frac{6}{5}$

2. For what q is $\sum_{n=1}^{\infty} \frac{2}{n^{3q-1}}$ convergent

A. $q \leq \frac{2}{3}$

B. $q > \frac{2}{3}$

C. $q > \frac{1}{3}$

D. $q > 1$

E. $q \leq 1$

3. Which of the following series converge?

I. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{2\sqrt{n}-1}$ II. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n\,2^n}$ III. $\displaystyle\sum_{n=1}^{\infty} \frac{n+1}{3n+2}$

A. Only I.

B. Only II.

C. Only II and III.

D. Only I and II.

E. None are true.

4. Which of the statements are true?

I. If $a_n > 0$ and $\displaystyle\sum_{n=1}^{\infty} a_n$ converges, then so does $\displaystyle\sum_{n=1}^{\infty} \frac{a_n}{\sqrt{n}}$.

II. If $a_{n+1} < a_n$ for all n, and $\displaystyle\lim_{n\to\infty} a_n = 0$, then $\displaystyle\sum_{n=1}^{\infty} a_n$ converges.

III. If $a_n > 0$ and $\displaystyle\lim_{n\to\infty} \frac{a_{n+1}}{a_n} = \frac{1}{2}$, then $\displaystyle\sum_{n=1}^{\infty} a_n$ converges.

Then

A. I only

B. II only

C. III only

D. I and II only

E. I and III only

5. According to the alternating series estimation theorem, what is the smallest number of terms of the series

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

that we need to add in order to find the sum with an error less than $(9.9)^{-7}$?

A. 6 terms

B. 7 terms

C. 8 terms

D. 9 terms

E. 10 terms

6. Which of the following series converges?

(I) $\displaystyle\sum_{n=1}^{\infty}\left(\frac{n^2+1}{2n^2+1}\right)^n$

(II) $\displaystyle\sum_{n=1}^{\infty}\frac{n!}{(2012)^n}$

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

A. (I) and (II) only

B. (II) and (III) only

C. (I) and (III) only

D. All

E. None

7. Knowing that $\lim_{k\to\infty}\left(1+\frac{a}{k}\right)^k = e^a$, we can conclude that

I. $\sum_{k=1}^{\infty}\left(1+\frac{2}{k}\right)^{k^2}$ converges.

II. $\sum_{k=1}^{\infty}\left(1-\frac{1}{k}\right)^{k^2}$ converges.

III. $\sum_{k=1}^{\infty}\left(1-\frac{1}{2k}\right)^{k^2}$ converges.

A. I and II are true, but III is false

B. I and III are true, but II is false.

C. I is false, but II and III are true.

D. All false.

E. All true.

8. Which of the following alternatives are correct?

I. The series $\sum_{k=1}^{\infty}(-1)^k\frac{1}{k\ln k}$ converges conditionally.

II. The series $\sum_{k=1}^{\infty}(-1)^k\frac{1}{k(\ln k)^2}$ converges absolutely.

III. The series $\sum_{k=1}^{\infty}(-1)^k\frac{\arctan(k)}{k^3}$ converges absolutely.

A. I and II only

B. I and III only

C. II only

D. I, II and III are true

E. None

9. Find the interval of convergence of $\displaystyle\sum_{k=1}^{\infty} \frac{(3x-1)^k}{2^k k^4}$.

A. $\left[-\frac{1}{3}, 1\right]$

B. $\left(-\frac{1}{3}, 1\right]$

C. $\left(-\frac{1}{3}, 1\right)$

D. $(-1, 1)$

E. $\left[-\frac{1}{3}, \frac{2}{3}\right]$

10. Suppose the power series $\displaystyle\sum_{n=1}^{\infty} c_n x^n$ converges when $x = -3$ and diverges when $x = 4$. Which of the following are always true?

I. $\displaystyle\sum_{n=1}^{\infty} c^n(-2)^n$ converges

II. $\displaystyle\sum_{n=1}^{\infty} c^n(-5)^n$ converges

III. $\displaystyle\sum_{n=1}^{\infty} c^n(2.5)^n$ converges

A. I and II only

B. I and III only

C. II only

D. I, II and III

E. None of the above

11. Find the coefficient of x^{12} in the Maclaurin series for $f(x) = \sin\left(\frac{x^4}{2}\right)$.

A. 0

B. $-\frac{1}{24}$

C. $\frac{1}{12}$

D. $-\frac{1}{48}$

E. $\frac{1}{18}$

12. Evaluate the indefinite integral $\int \frac{t}{1+t^3}\,dt$ as a power series

A. $\sum_{n=0}^{\infty} t^{3n} + C$

B. $\sum_{n=0}^{\infty} (-1)^n t^{3n+1} + C$

C. $\sum_{n=0}^{\infty} (-1)^n \frac{t^{3n+2}}{3n+2} + C$

D. $\sum_{n=0}^{\infty} \frac{(-1)^n t^{3n+1}}{3n+1} + C$

E. $\sum_{n=0}^{\infty} \frac{t^{3n}}{3n} + C$