MATH 152, SPRING 2006
COMMON EXAM III - VERSION B

LAST NAME, First Name (print): ______________________________

INSTRUCTOR: ______________________________

SECTION NUMBER: ______________

UIN: ______________________________

DIRECTIONS:

1. The use of a calculator, laptop or computer is prohibited.
2. In Part 1 (Problems 1-10), mark the correct choice on your ScanTron form No. 815-E using a No. 2 pencil. *For your own records, also record your choices on your exam!* ScanTrons will be collected from all examinees after 90 minutes and will not be returned.
3. In Part 2 (Problems 11-15), present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate your final answer.* You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.
4. Be sure to *write your name, section number and version letter of the exam on the ScanTron form.*

THE AGGIE CODE OF HONOR

"An Aggie does not lie, cheat or steal, or tolerate those who do."

Signature: ______________________________

DO NOT WRITE BELOW!

Question	Points Awarded	Points
1-10		50
11		10
12		15
13		6
14		9
15		10
		100

PART I

1. (5 pts) $\lim_{n \to \infty} \left[\frac{n^2+1}{n^2} \sin\left(\frac{\pi n}{2n+1} \right) \right] =$

   (a) -2
   (b) 1
   (c) 2
   (d) doesn't exist
   (e) -1

2. (5 pts) Which series converges, but not absolutely?

   I. $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^8}$ II. $\sum_{n=1}^{\infty} (-1)^{n+1} \left(\frac{n^5+2}{n^3} \right)$ III. $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[4]{n}}$

   (a) only III
   (b) I and II
   (c) II and III
   (d) I and III
   (e) only I

Exam continues on next page

3. (5 pts) The Maclaurin series for $1/(1+x^4)$ is

(a) $\sum_{n=0}^{\infty} x^{-4n}$

(b) $\sum_{n=0}^{\infty} (-1)^n x^{2n}$

(c) $\sum_{n=0}^{\infty} (-1)^n x^{4n}$

(d) $\sum_{n=0}^{\infty} x^{4n}$

(e) $\sum_{n=0}^{\infty} x^{2n}$

4. (5 pts) Compute $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$. (Hint: Use partial fractions)

(a) 1

(b) $\frac{7}{6}$

(c) 2

(d) $\frac{5}{6}$

(e) $\frac{4}{5}$

Exam continues on next page

5. (5 pts) Which of the following are true?

I. If $\lim_{n\to\infty} b_n = 0$, then $\sum_{n=1}^{\infty} b_n$ converges.

II. If $0 \le a_n \le b_n$ and $\sum_{n=1}^{\infty} b_n$ diverges, then $\sum_{n=1}^{\infty} a_n$ diverges.

III. If $\sum_{n=1}^{\infty} a_n$ converges, then $\lim_{n\to\infty} a_n = 0$.

(a) only I
(b) I and III
(c) only II
(d) II and III
(e) only III

6. (5 pts) $\sum_{n=1}^{\infty} \frac{2^n}{3^n} =$

(a) Does not exist
(b) 2
(c) 3
(d) $\frac{2}{3}$
(e) $\frac{3}{2}$

Exam continues on next page

7. (5 pts) $\displaystyle\sum_{n=3}^{\infty} \frac{1}{n \ln n}$

(a) diverges by the integral test
(b) converges by the integral test
(c) converges by the ratio test
(d) diverges by the ratio test
(e) converges by the alternating series test

8. (5 pts) The sequence $\left\{ \dfrac{\sin n}{n} \right\}_{n=1}^{\infty}$

(a) converges to 0
(b) converges, but is not bounded
(c) converges to 1
(d) diverges, but is bounded
(e) none of the above

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9. (5 pts) For what values of x does the power series $\displaystyle\sum_{n=1}^{\infty} \frac{x^{2n}}{\sqrt{n}}$ converge?

(a) for all x

(b) only $x = 0$

(c) $-1 \leq x < 1$

(d) $-1 \leq x \leq 1$

(e) $-1 < x < 1$

10. (5 pts) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{(1+n)n^p}$

(a) diverges for all $p \leq 1$

(b) diverges if $p > 1$

(c) diverges for all p

(d) converges for all p

(e) converges if $p > 0$

Exam continues on next page

PART II

11. (10 pts) Find the radius and interval of convergence for the power series $\sum_{n=1}^{\infty} \frac{(x-3)^n}{n\,4^n}$. Identify the test(s) you are using and clearly show your work.

Exam continues on next page

12. Determine whether the infinite series converge or diverge. Identify the test(s) you are using and clearly show your work.

(a) (5 pts) $\displaystyle\sum_{n=1}^{\infty} \frac{e^n}{n!}$

(b) (5 pts) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{1+\ln n}$

(c) (5 pts) $\displaystyle\sum_{n=1}^{\infty} \frac{n}{n^{2.001}+4}$

Exam continues on next page

13. (6 pts) Find the Taylor series for $f(x) = e^{3x}$ at $a = 2$.

14. (a) (5 pts) Use the Maclaurin series for $\sin z$ to express $\int_0^1 \sin(x^2)\,dx$ as an infinite series.

(b) (4 pts) Find a bound on the error made when approximating $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ by $\displaystyle\sum_{n=1}^{9} \frac{(-1)^{n+1}}{n^2}$.

Exam continues on next page

15. (a) (5 pts) Find two distinct *unit* vectors that are parallel to $\langle 1, 2, -2 \rangle$.

(b) (5 pts) Find the vector projection of $\mathbf{b} = \langle 4, 2, 0 \rangle$ onto $\mathbf{a} = \langle 1, -1, 1 \rangle$.

End of exam