MATH 141

EXAM II

NOVEMBER 6, 2003

NAME _____

STUDENT NUMBER _____

INSTRUCTOR _____

SECTION NUMBER _____

This examination will be machine processed by the University Testing Service. Use only a number 2 pencil on your scantron. On your scantron identify your name, this course (Math 141) and the date. Code and blacken the corresponding circles on your scantron for your student I.D. number and class section number. Code in your test form.

There are 7 multiple choice questions worth a total of 42 points. For the problems 1 to 6, **five** possible answers are given, only one of which is correct. You should solve the problem, circle the letter of your answer in the exam form and **blacken** the corresponding space on the **scantron**. Mark only one choice; darken the circle completely (you should not be able to see the letter after you have darkened the circle). Check frequently to be sure the problem number on the test is the same as the problem number of the scantron. There are **4** partial credit questions (58 points). **In order to obtain full credit for the partial credit problems, all work must be shown**. **Credit will not be given for an answer not supported by work**. The point value for each partial credit question is given in parentheses to the right of the question number.

THE USE OF CALCULATORS IS NOT PERMITTED IN THIS EXAMINATION.

8. (15 pts.)	
9. (15 pts.)	
10. (15 pts.)	
11. (13 pts.)	
Total	

Do not write in the box to the left.

1. Let N be the number of equal intervals into which the interval $[0, 1]$ has to be subdivided so that the error bound in the Trapezoidal Rule for calculating

$$\int_0^1 e^{x^2} dx$$

is less than 10^{-10}. Then N is necessarily greater than
(*Recall that the error bound in the Trapezoidal rule is given by*

$$|E_T| \leq \frac{K(b-a)^3}{12N^2}$$

where $K = \max_{x \in [a,b]} |f''(x)|$)

a) $10^5 \sqrt{\frac{e}{2}}$

b) $10^8 \sqrt{e}$

c) 10^8

d) 10^3

e) $10^3 \sqrt{e}$

2. $\lim_{x \to 0^+} \frac{x - x^3/6}{\sin x}$ is equal to

a) 0

b) 1

c) ∞

d) π

e) The limit does not exist.

3. Evalute $\int_0^3 \frac{1}{x^{2/3}} dx$.

a) 3

b) ∞

c) $3^{1/3}$

d) $3^{4/3}$

e) $3^{-2/3}$

4. Find the sum of the following geometric series.

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

a) 1

b) 1/5

c) 0

d) $-2/15$

e) $-2/3$

5. When $\sum_{n=1}^{\infty} a_n = 10$, calculate $\lim_{n\to\infty} e^{a_n}$.

a) 0

b) 1

c) 10

d) e^{10}

e) It diverges.

6. Find the sum of the following telescoping series.

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

a) -1

b) $-1/2$

c) 0

d) $1/2$

e) 1

7. (6 points) For each of the **series** given below, choose the right answer.

(I) $\sum_{n=1}^{\infty} \frac{\tan^{-1}(n)}{n^2}$

a) converges

b) diverges

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

a) converges

b) diverges

(III) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} 4^n}{n^3}$

a) converges

b) diverges

8. (15 pts.) Determine whether the given **sequence** converges or diverges. If it converges, calculate its limit.

a) $a_n = \dfrac{\sin n}{n^2}$

converges to _____ diverges

b) $a_n = \dfrac{\sqrt{4n^4 + 2n^2 + 1}}{3n^2 + 1}$

converges to _____ diverges

c) $a_n = 1 + (-1)^n$

converges to _____ diverges

9. (15 points) Evaluate the following *improper* integral.

$$\int_0^3 \frac{1}{(x-2)^{\frac{1}{3}}} dx$$

10. (15 points) Determine whether the following series

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

converges or diverges. Indicate the theorem(s) and/or test(s) and justify your answer.

11. (13 points) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{2n^2 + n + 1}{\sqrt{n^6 + n + 1}}$$

Indicate the theorem(s) and/or test(s) and justify your answer.