MATH 162

Midterm 2

November 16, 2006

NAME (please print legibly): _____

Your University ID Number: _____

Circle your Instructor's Name along with the Lecture Time:

Vermesi 9:00 Mueller 10:00

- **No calculators are allowed on this exam.**
- **Please show all your work. You may use back pages if necessary. You may not receive full credit for a correct answer if there is no work shown.**
- **Please put your simplified final answers in the spaces provided.**

QUESTION	VALUE	SCORE
1	11	
2	11	
3	11	
4	11	
5	12	
6	11	
7	11	
8	11	
9	11	
TOTAL	100	

1. (11 points)

Express the following continued fraction as a rational number.

$$82.626262\ldots$$

If you can express it as the sum of two rational numbers, that's also OK.

2. (11 points)

Find the sum of the following series.

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

Hint: Use partial fractions.

3. (11 points)

(a) (5 points) Does the following series converge or diverge?

$$\sum_{n=1}^{\infty} \frac{2n}{\sqrt{n^2+3}}$$

ANSWER: _____

(b) (6 points) Why or why not?

4. (11 points)

(a) (5 points) Does the following series converge or diverge?

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

ANSWER: _____

(b) (6 points) Justify your answer in part (a).

5. (12 points)

Consider the series

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

(a) (3 points) Does this series converge or diverge?

ANSWER: _____

(b) (4 points) Justify your answer in part (a).

(c) (5 points) Suppose we approximate the series by taking the sum of the first n terms, up to and including $(-1)^n(1/n^2)$. What is the first value of n for which our error is less than or equal to $1/10^4$?

6. (11 points)

(a) (5 points) Does the following series converge or diverge?

$$\sum_{n=1}^{\infty} \frac{3^n + 7}{2^n - 1}$$

ANSWER: _____

(b) (6 points) Justify your answer in part (a), making sure to name any convergence tests that you are using.

7. (11 points)

(a) (5 points) Does this series converge or diverge?

$$\sum_{n=1}^{\infty} \frac{\pi^{n+3}}{n^{n/2}}$$

ANSWER: _____

(b) (6 points) Justify your answer in part (a), making sure to name any convergence tests that you are using.

8. (11 points)

(a) (5 points) Does this series converge or diverge?

$$\sum_{n=1}^{\infty} \frac{3^n \sqrt{n+2}}{7(2n)!}$$

ANSWER: _____

(b) (6 points) Justify your answer, making sure to name any convergence tests that you are using.

9. (11 points)

Find the limit of this sequence.

$$\lim_{n\to\infty} n \tan\left(\frac{1}{n}\right)$$