Math 1312 Spring 2007
Calculus II

Third Midterm Exam

Tuesday, April 3, 7:00 PM - 9:00 PM

Your name (please print):

Instructions: Other than a single 8.5" × 11" page of handwritten notes, this is a closed book, closed notes exam. **Use of calculators is not permitted.** You must justify all of your answers to receive credit. Notation is important, and points will be deducted for incorrect use. Please do all of your work on the paper provided, work each problem on a separate sheet of paper, and staple your pages in the correct order when you are finished.

The Honor Code requires that you neither give nor receive any aid on this exam.

If you are bound by the Academic Honor Code, please indicate that you have read and understood these guidelines by signing your name in the space provided:

Pledged: _____

Do not write below this line

Problem	**1**	**2**	**3**	**4**	**5**
Points	10	10	10	10	60
Score					

Total:_____

1. Define the sequence $\{a_n\}$ by setting $a_1 = 1$ and

$$a_{n+1} = \frac{1}{1 + a_n}$$

for $n \geq 1$. Assuming that $\{a_n\}$ is convergent, find its limit.

2. Let $\{p_n\}$ be the sequence of prime numbers, i.e.

$$\{p_n\} = \{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, \ldots\}.$$

Show that

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

converges.

3. Find a power series representation for the function

$$g(x) = \frac{x}{x - 5}$$

in powers of x and state for which values of x this representation is valid.

4. Find the interval of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{x^n}{3^n n^{1/2}}.$$

Don't forget to check for convergence at the endpoints of the interval!

5. Determine if the series converges or diverges. If it converges, determine if this convergence is absolute or conditional.

a. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n+1}{n^3 - 3n^2 + 9n + 13}$

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

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

d. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt[4]{n+1}}$

e. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n}{n+5}$

f. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{5 + (-3)^n}$