MA 2733
Examination 3 – November 20, 2013

Name ________________________________

5 T/F, several long answer. 50 points.

General Instructions: Please answer the following, without use of calculators. You may refer to a 3x5 card, but no other notes. Correct answers without correct supporting work may not receive full credit (excluding the True/False section). You may use the back of each page for additional answer space (please clearly indicate if you have done so), or scratch work.

Mississippi State University Honor Code: "As a Mississippi State University student I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

Signature ________________________________

1. True/False. Enter T or F in each blank. A correct answer is worth 2 points, a blank space is worth 0 points, and a wrong answer is worth -2 points. (Your total on this problem will be rounded up to zero if necessary.)

(a) _____ If $\sum_{n=0}^{\infty} a_n$ converges, then $\lim_{n\to\infty} |a_{n+1}/a_n| \leq 1$.

(b) _____ Suppose $a_n \leq 0$ for all n. If the series $\sum_{n=0}^{\infty} a_n$ converges, then the series converges absolutely.

(c) _____ We can consider $f(x) = x^{10}$ to be a power series.

(d) _____ In the power series $f(x) = \sum_{k=0}^{\infty} k \cdot x^k$, the coefficient of x^5 is 5.

(e) _____ If $\sum_{n=0}^{\infty} a_n$ converges, then $a_n \leq \frac{1}{n^2}$ for all $n \geq A$ (for some A).

2. Discuss convergence of the following series: determine whether each is absolutely convergent, conditionally convergent, or divergent.

   (a) (6 points) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{\sqrt{n-1}}$.

   (b) (6 points) $\displaystyle\sum_{n=0}^{\infty} \frac{n^2+3n-5}{2^n}$.

   (c) (6 points) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n \cos n}{2^n}$.

(d) (8 points) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{n+1}}$.

3. (6 points) On what interval does the power series $\displaystyle\sum_{n=1}^{\infty} \frac{x^n}{n \cdot 2^n}$ converge?

   (0 points for correct interval, 6 points for showing the power series converges on the interval, and diverges off of it.)

4. The “explain” problem.

(a) (4 points) Prove that $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges.

(b) (4 points) Prove that $\sum_{n=1}^{\infty} \frac{1}{n^2}$ converges.