Math 213 Quiz # 1 Review

By: The process of turning coffee beans into the liquid also known as coffee

April 16, 2008

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Hi everyone! We would have made the arrows better, but for some reason we can't figure out how to make the arrow appear in the center of the pictures. Oh well. Enjoy this review sheet! The quiz is Thursday, April 24th, and covers the sections below. ROCK ON!

1. Section 9.1: Sequences and convergence. Here we learn the basic techniques for determining if a sequence converges. We really had several tools. The first would be L'Hospital's rule, which would be a good rule to remember for sequences that take on an indeterminate form. Also there were several other properties of convergent sequences that we could use to determine if other sequences converged. Generally, the homework questions from this section form a great collection of examples, with emphasis on the situation when I give you a sequence a_n and ask the yes or no question "does the sequence a_n converge?"

2. Section 9.2: Series and convergence. We learned that convergence or divergence of an infinite series is linked to the convergence or divergence of the sequence of partial sums. We learned of two types of series and determined what they converge to (or if they diverge). The geometric series $\sum_{n=0}^{\infty} r^n$ converges to $\frac{1}{1-r}$ when $-1 < r < 1$, and diverges otherwise. There are several types of telescoping series, which converge. There is no one general telescoping series that we may model "the" telescoping series after, as there is no notion of "the" telescoping series... there are several. But knowing

that these sort of series converge (or diverge) is good to know, and in the event a series of these sorts converges, one should know how to compute what it converges to. Note also that there are some cases where you'll have to use a little elbow grease, for example, a geometric series which begins at $n = 1$ or 2, rather than at $n = 0$. The last important result of this section is the infamous test for divergence, which will only tell you for certain if a series diverges (when $\lim a_n \neq 0$), and will never tell you if a series *converges*.

3. Section 9.3: The integral test and p-series. This section discussed a test for convergence and divergence known as the integral test, and we applied it to special series of the form $\sum_{n=1}^{\infty} \frac{1}{n^p}$, known as p-series. We determined that these p-series converge when $p > 1$, and diverge for any other value of p. This is a good test to know, as is the integral test. See class notes and homework for good examples to study.

4. Section 9.4: Comparison of series. We learned about comparison tests for series in this section. For example, if we can bound a (positive) series above by a convergent series, then the original series must have converged. If we bound a series below by a divergent (positive) series, then our original series must also diverge. We also investigated the observation that series that behave similarly must have their convergence or divergence linked. For example, there is no direct and useful comparison to $\frac{1}{n^2-.5}$ to the convergent p-series $\frac{1}{n^2}$, although they behave similarly. So we had a test which linked the convergence or divergence of these series, known as the limit comparison test, and I suggest you learn this test very well, as it has always been useful!

5. Other suggestions: ROCK ON!