Name: ______________________________ Section: ________________

MA 114 QUIZ #3

September 18, 2014

The following quiz is worth 4 points. Each problem will be worth 2 points. Be sure to read the problem carefully and answer every part of the problem. Be sure to show all of your work. Answers without support will not receive any credit.

1. Determine if the following series converges absolutely, converges conditionally, or diverges.

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n^{1/3}}$$

This is an alternating series. We have

$$\frac{1}{(n+1)^{1/3}} < \frac{1}{n^{1/3}} \text{ for all } n, \text{ and } \lim_{n\to\infty} \frac{1}{n^{1/3}} = 0.$$

So, the series converges by the Leibniz test. However,

$$\sum_{n=1}^{\infty} \left| \frac{(-1)^n}{n^{1/3}} \right| = \sum_{n=1}^{\infty} \frac{1}{n^{1/3}}$$

This is a p-series with $p < 1$, so it diverges. Then the series does not converge absolutely and thus converges conditionally.

One point for showing convergence and one point for showing conditional convergence.

2. Use the Ratio Test to determine if the following series converges absolutely.

$$\sum_{n=1}^{\infty} \frac{e^n}{n!}$$

We have

$$\left| \frac{a_{n+1}}{a_n} \right| = \left| \frac{e^{n+1}}{(n+1)!} \cdot \frac{n!}{e^n} \right| = \frac{e}{n+1}.$$

Then

$$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = \lim_{n\to\infty} \frac{e}{n+1} = 0 < 1,$$

and the series converges absolutely by the ratio test.

One point for simplifying the limit, and one point for the correct conclusion.