M210T - Emerging Scholars Seminar
Worksheet 6
February 10, 2010

1. Converge or diverge?

$$\sum_{n=1}^{\infty}(-1)^n\frac{3n-1}{2n+1}, \quad \sum_{n=1}^{\infty}\cos(n\pi)n^{-3/4}, \quad \sum_{n=1}^{\infty}(-1)^n\frac{n^n}{n!}, \quad \sum_{n=1}^{\infty}\frac{(-1)^n}{n-\sqrt{n}+1}$$

2. We talked last time about my own strategy for approaching questions of convergent or divergent series. What is your strategy? What tests do you consider first? Does it depend? On what?

3. How many terms of the series $\sum_{n=1}^{\infty}(-1)^n n^2/n!$ must you consider in order to approximate the limit with error less than $1/1000$?

4. The Alternating Series Test states that if $\{b_n\}$ is a positive sequence that decreases to zero, then $\sum(-1)^n b_n$ converges. Show that the hypothesis that $\{b_n\}$ is decreasing is necessary; i.e. find a sequence $\{b_n\}$ that converges to zero, but so that $\sum(-1)^n b_n$ diverges.

5. * You and two otherwise intelligent friends wake up from a night of partying. You see that your friends have been defaced with a permanent marker. You naturally start laughing, as do your friends. After a while, you suddenly stop laughing. Why?