Assignment #11

1. Let s_n denote the n-th partial sum of the *harmonic series.* Show that for each $n \in \mathbb{N}$ we have $s_{2n} - s_n > 1/2$. Show how this fact, along with a result from the Asgn. #10 handout, gives another proof that the harmonic series diverges.

2. *"log-p series:"* Use the Cauchy condensation test, along with a result derived in class, to find those real numbers $p > 0$ for which $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^p}$ converges.

3. *Extra Credit:* Same question, but now for the series $\sum_{n=3}^{\infty} \frac{1}{n(\ln n)(\ln \ln n)^p}$.

   Explain the why the series starts with $n = 3$.

   The two previous results suggest a more general one. State it and give me an idea of how to prove it.

Problems due Wednesday, February 15

Before start of class

1. Exercise 2.3.6

2. Exercise 2.4.5(a)

   Suggestion: for the lower bound on x_n, use Calculus to analyze the graph $y = \frac{x}{2} + \frac{1}{x}$.

3. Exercise 2.4.1.

   Also: show that the Cauchy Condensation Test *fails* if the hypothesis "$b_n \downarrow$" is omitted.

4. Problem #3 on Homework Assignment #11 above.