MATH 1B Fall 2015
Section 4 Name: _____

Sequence and series are different but yet connected things, make sure that you understand the definition of both clearly. Don't mess them up!

Also make sure that you understand and know how to use "monotonic convergent theorem".

Warm Up Questions: Find the limit of the following sequences

1. $a_n = \dfrac{3+5n^2}{n+n^2} = 5$

2. $a_n = \ln(n+1) - \ln n = 0$
Comment: You have to combine the two logs

Intermediate questions:

3. Show that if $\{a_n\}$ is convergent then $\lim_{n\to\infty} a_n = \lim_{n\to\infty} a_{n+1}$.
Comment: Use definition to prove, but also notice that this equality tells you that one sequence can have only one limit.

4. Use the definition of limit of sequence to prove that $\lim_{n\to\infty} r^n = 0$ if $|r| < 1$.
Comment: Use the definition, and for every ϵ find the corresponding N.

Is the following series convergent or divergent:

5. $\sum_{n=1}^{\infty} \ln(1+\frac{1}{n})$.
Comment: Convergent by limit comparison test.

6. $\sum_{n=2}^{\infty} \dfrac{1}{n(\ln n)^2}$.
Comment: Convergent by integral test.

Ultimate challenges :)

7. Let $p_{n+1} = \dfrac{2p_n}{1+p_n}$
Find the limit of $\{p_n\}$. (Hint: condition on p_0).
Try to show that $\{p_n\}$ is bounded and monotonic using induction, then solve a quadratic equation to get the limit of p_n.

8. For what values of p does the following series converge: $\sum_{n=2}^{\infty} \dfrac{1}{n(\ln n)^p}$
Comment: Use integral test and $p-$series.