Problem Set 6 – Math 486-W11

1. Your in-class group should email me your description of how to prove that a sequence is convergent.
2. Consider the following sequence:

$$\begin{aligned}
a_1 &= 0.1, \\
a_2 &= 0.1001, \\
a_3 &= 0.100100001, \\
a_4 &= 0.1001000010000001, \\
a_5 &= 0.10010000100000010000000001, \\
a_6 &= 0.100100001000000100000000100000000001, \\
a_7 &= 0.10010000100000010000000010000000000010000000000001, \ldots.
\end{aligned}$$

   (Each time, the number of zeros between the 1's increases by two.)

   a) What is $a_n - a_{n-1}$ in terms of n?
   b) Prove that the sequence a_n converges.

3. Let $b_n = -a_n$, where a_n is the sequence in (2).

   a) State the least upper bound property of the reals.
   b) Use the least upper bound property to construct a candidate limit for the sequence b_n.
   c) Prove that the sequence b_n converges to the candidate limit you constructed in the previous part.