Math 441 - Homework 8 **Due Friday, Oct. 30**

1. Let $s_1 = \sqrt{7}$, $s_2 = \sqrt{7+\sqrt{7}}$, $s_3 = \sqrt{7+\sqrt{7+\sqrt{7}}}$, and in general define $s_{n+1} = \sqrt{7+s_n}$. Prove that (s_n) converges, and find its limit.

2. Consider the collection of all Cauchy sequences of rational numbers. For two such sequences (a_n) and (b_n), we say that $(a_n) \sim (b_n)$ when $\lim a_n - b_n = 0$. Prove that this relation is an equivalence relation.

3. Let (s_n) be a sequence, and suppose that $\{s_n : n \in \mathbb{N}\}$ has an accumulation point s. Prove that there is a subsequence of (s_n) that converges to s.

4. Prove that any strictly increasing sequence of natural numbers must be unbounded. *Hint: Try a proof by contradiction and use the well-ordering principle.*