Assignment 3, Math 712
Due Mar. 12, emailed to me in scanned pdf format (no pictures please)

1. Prove König's Lemma: Any infinite finite-branching tree has an infinite path.

2. Use the proof method we used in class to prove the infinite Ramsey Theorem and give some form of upper bound based on the parameters and proof method. That is, suppose that we are trying to find a number L such that all k-colourings of n-element subsets have a homogeneous set of size m. Construct a tree-ordering $\prec$ as in class and argue that you can find paths of some desired length.

3. The Szemeredi Regularity Lemma can also be proven for hypergraphs. State this theorem and roughly outline how our ultraproduct proof would have to change in order to get a proof of this version of the Lemma.

4. Show that if a field K has a unique extension L of degree n, up to isomorphism, then the automorphism group of L over K is cyclic.