CSC2421S **Problem Set 3** **Winter/Spring 2005**

Due: Thursday, April 29

1. Modify the analysis of the simple local search algorithm for weighted Max2Sat (ie the one that yields a 2/3 approximation) to show that an approximate local optimum can be used to insure fast convergence and a $(2/3 - \epsilon)$ approximation.

2. (a) Consider the simple randomized algorithm for (unweighted) MaxCut which uniformly at random places each vertex in A or B and thus produces a cut (A, B). Show that this yields a cut with expected size $EXP[|cut(A, B)|] = \frac{1}{2}|E|$. Here $cut(A, B)$ is the set of edges with one end in A and the other end in B.

   (b) Show how to use the method of conditional expectations to derandomize this algorithm.

   (c) Consider the following greedy algorithm for the unweighted max cut algorithm. For each vertex v (in any order), place v in A or B so as to maximize the increase in the size of $cut(A, B)$. What is the relation of this greedy algorithm to the derandomized algorithm above? Prove explicitly (without reference to the derandomized algorithm) that the greedy cut size is at least $\frac{1}{2}|E|$.