COMP 599 Assignment 2

Due Thursday February 21st

1. (a) Show that for some function h, the following statement is true:
   (*) If (G,X) is an instance of k-Realizations such that G is planar then every h(k)-protected vertex is irrelevant,
   (b) Show that if (*) holds for a particular value of h(k) then if (G,X) is an instance of k-Realizations such that K_5 is not a minor of G then every (h(k) +3)-protected vertex is irrelevant.

2. Show that if for every k there is a linear time algorithm to solve k-Realizations in planar graphs then for every k there is a linear time algorithm to solve k-Realizations in graphs without a K_5 minor.

3. The k by k grid has vertices $v_{i,j}$ for I and j between 1 and k such that two vertices are adjacent if they agree on one index and disagree by one on the other. Use our results on c-embedded k-realizations to show that for every l, there is an f(l) such that if G is obtained from a grid by adding (l choose 2) edges such that for any two endpoints of these edges, both indices differ by at least f(l) then K_l is a minor of G.

   PLEASE DO NOT CITE ANYTHING OTHER THAN RESULTS PRESENTED IN CLASS, PARTS OF MY MONOGRAPH ALREADY HANDED OUT, AND THE FACT PROVEN BY Li and Reed that you can find the blocks of the $K_{3,3}$ block tree in linear time for K_5 minor free graphs.