Graph Theory
Assignment 2
Due 10:00 AM, Friday January 27th

1) Exercise 1.1 from Chapter 1 of the graph colouring book.

2) Exercise 1.3 from Chapter 1 of the graph colouring book.

3) Exercise 1.4 from Chapter 1 of the graph colouring book.

4) Show that if $\mathcal{F}$ is a family of graphs such that every graph in $\mathcal{F}$ is planar or a clique or has a clique cutset then for all G in $\mathcal{F}$, $\chi(G) \leq \omega(G) + 2$.

5) a) Show directly (e.g. without applying the 4CC) that if G is a planar graph without triangles then G has chromatic number at most four.

b) Show directly (e.g. without applying the 4CC) that if G is a planar graph every edge of which is in at most one triangle then G has chromatic number at most four.

6) Assume that you have a polynomial time algorithm to test if a graph is planar which can be used as a subroutine.

a) Give a polynomial time algorithm that tests if a graph has a K_5 minor.

b) give a polynomial time algorithm that finds a K_5 minor in a graph that has one.

You are not allowed to apply known algorithms (like Robertson and Seymour's) to do 6, just what we did in class.