COM 304
Assignment 5
Due at 7 p.m., Tuesday, December 2, 2008
All problems are of equal value.

Reading

Cormen, Leiserson, Rivest, Stein, Chapters 34 and 35 (with emphasis on sections 35.1-3).

Practice

CLRS, 34.1-1..6, 34.2-1..8, 34.2-11, 34.3-1..3, 34.3-7, 34.4-3..7, 34.5-4..8, 34-2, 34-3, 35.1-1..5, 35.2-1..5, 35.3-1..5, 35-4.

To Be Handed In

1. CLRS, 34.3-6.
2. CLRS, 34.5-1.
3. CLRS, 34-1 parts (a) and (b).
4. CLRS, 35-1.
5. A k-coloring of a graph G is an assignment of numbers (colors) from 1 to k to each vertex of G such that adjacent vertices are assigned different colors.
   (a) Show there is a polynomial time algorithm which finds a 2-coloring of a graph if the graph can be colored with 2 colors.
   (b) Show there is a polynomial time algorithm which finds a 6-coloring of any planar graph. (Make sure you show your algorithm runs in polynomial time by giving an upper bound on its running time.) You may use the fact that any planar graph has a vertex of degree 5 or less.
   (c) Show how to color a planar graph using at most two times the optimal number of colors required to color graph, i.e., give a 2-approximation algorithm for the problem of coloring a planar graph. You may use the fact that any planar graph can be colored with at most 4 colors.

Bonus

You have 10 stacks of coins, each containing 10 quarters. One entire stack of coins is counterfeit but you don't know which. You know that a quarter weighs 10 grams and that the counterfeit quarters weigh 9 grams. You have a scale which measures the weight of any number of coins to the exact gram. What is the smallest number of weighings necessary to determine which stack is counterfeit?