Review for Exam 6 in CS 113

Chapter 6 was about graphs.

1. Know the vocabulary:
Be able to identify these terms in a graph: Vertex, edge, adjacent vertices, loop, isolated vertex, a vertex incident on an edge and an edge incident on a vertex, degree of a vertex, face. Be able to show/draw/point out a path, simple path, cycle, simple cycle, subgraph.

Be able to determine if a given graph is a: directed graph (digraph), weighted graph, simple graph, complete graph on n vertices (K_n), complete bipartite graph on n,m vertices ($K_{n,m}$), connected graph.

Be able to determine if a cycle is an Euler cycle or a Hamiltonian cycle, and perhaps even find one in a graph. Be able to determine if a graph has an Euler cycle.

Be able to create an adjacency and/or an incidence matrix for a given graph.

Be able to tell if two graphs are isomorphic. The key idea that we talked about was how to tell if they are *not* isomorphic using the idea of invariants. Know what invariants are (in general), and know several for a graph.

Be able to tell if a graph is planar or not. (Kuratowski'sTheorem might be helpful here.) If it is planar, be able to verify Euler's formula. (Memorize it first!)

2. For each idea we covered, be able to give an example of it in terms of a graph, or be able to explain it in term of a graph.
Some graphs we discussed: Bacon or Erdös numbers, drilling holes in sheet metal, similarity graphs, traveling salesman problem, knight's tour, parallel computing and the hypercube, the bridges of Königsberg.

For example, a Hamiltonian cycle is an example of a solution to the traveling salesperson problem.

3. Know what a Gray code is. Be able to write one using n bits.

4. Be able to prove or explain why these things are true.
   a.) The sum of the degrees of all the vertices in a graph is even.
   b.) There is a Gray code for every positive integer n.
   c.) Euler's formula holds for every planar graph.

Some good problems to work on: p. 283, #68 and p. 300, #26.