MATH3012, Fall, 2008
Review for Test 3

Test 3 will cover Chapter 11. The test problems will be similar to the problems assigned and examples given in the class. A formula sheet is allowed; however, examples should not be included.

You need to be familiar with the following concepts: graph, multigraph, directed graph, directed multigraph, bipartite graph, plane graph, planar graph, subdivision of a graph, complete graph, complete bipartite graph, vertex, edge, multiple edges, loop, degree (a loop contributes 2 to degree), degree sequence, path, trail, walk, cycle, circuit, closed walk, Eulerian circuit, Hamilton cycle, isomorphism, isomorphic graphs, proper coloring, chromatic number, and chromatic polynomial.

We have several theorems which can be used to solve certain graph theory problems: the hand-shaking lemma and its consequences; a multigraph is Eulerian if and only if it is connected and every vertex has even degree; the sufficient conditions for the existence of Hamilton cycles and paths; Kuratowski's theorem for planar graphs; Euler's formula and its consequences; theorems about reductions on chromatic polynomials.

You are expected to solve the following problems. Given a sequence of integers, determine if it is the degree sequence of some graph (or multigraph); if yes, find a graph (or multigraph), and if not, explain why. Given two small graphs, determine if they are isomorphic; if yes, find an isomorphism, and if not, find a property that they do not share (such as number of vertices, edges, or cycles of certain length, etc.). Given a small graph or the degree sequence of some small graph, determine if it has an Eulerian circuit, a Hamilton cycle (or Hamilton path), or a cycle of certain length. Given a small graph (or the degree sequence of a small graph), determine if it is planar; if yes, find a drawing with no crossing edges, and if not, find a subdivision of $K_{3,3}$ or K_5. Given a graph, find its chromatic number and chromatic polynomial (using the reduction theorems).