Math 310
Exam 4 Review Sheet

Section 10.7: Planar Graphs

• Understand the definition of a planar representation of a graph and be able to find a planar representation for a graph (when one exists).
• Memorize Euler's Formula, know the definition of a region in a planar representation of a graph, and be able to verify that Euler's Formula holds for a given planar graph.
• Know the corollaries to Euler's Formula and be able to use them to show that a graph is not planar.
• Know and be able to apply Kuratowski's Theorem.

Section 10.8: Graph Coloring

• Know the definitions of a vertex coloring of a graph, and the (vertex) chromatic number of a graph.
• Be able to find the (vertex) chromatic number of a given graph.
• Know the four color theorem and be able to find the dual graph of a planar map *or* the dual graph of a planar graph.
• Be able to use graph vertex colorings to solve applications problems (like scheduling and radio frequency assignments).
• Know the definitions of an edge coloring of a graph, and the (edge) chromatic number of a graph.
• Be able to find the edge chromatic number of a given graph.

Section 11.1: Introduction to Trees

• Understand the definition of a tree, a forest, a simple circuit.
• Understand the proof of the theorem that states that an undirected graph is a tree if and only if there is a unique simple path between any pair of its vertices.
• Understand the definition of a rooted tree, parent vertices, children, descendants, ancestors, internal vertices, leaves, siblings, an m-ary tree, a full m-ary tree, and the level of a vertex in a rooted tree.
• Understand the proof of the theorem that states that a tree with n vertices has $n - 1$ edges.
• Understand the proof of the theorem that states that there are at most m^h leaves in m-ary tree of height h.

Section 11.2: Applications of Trees

• Understand the definition of a binary search tree and be able to construct a binary search tree for a given list of elements from a totally ordered set. Also be able to determine the number of comparison's needed to either find a node in a binary search tree or add a node to a binary search tree.
• Understand how to carry out a "tournament sort"
• Be able to construct and use a decision tree to solve an application problem (e.g. a weighing problem).

Section 11.3: Tree Traversal

• Understand how to find the universal address system for a given rooted m-ary tree.
• Be able to find the preorder, inorder, and postorder traversal for a given m-ary tree.
• Be able to draw the tree of a given computation and then give the expression for the computation in prefix, infix, and postfix form.
• Be able to draw the tree of a computation given in prefix, infix, or postfix form. Also be able to carry out the related computation.

Section 11.4: Spanning Trees

• Know the definition of a spanning tree for a connected graph and be able to find a spanning tree for a given graph.
• Understand how to find a spanning tree for a graph using a depth first search.
• Understand how to find a spanning tree for a graph using a breadth first search.
• Understand how to solve application problems using backtracking and spanning tree constructions.

Section 11.5: Minimum Spanning Trees

• Understand the definition of a minimum spanning tree for a connected weighted graph.
• Understand how to use Prim's Algorithm to find a minimum spanning tree for a given connected weighted graph.
• Understand how to use Kruskal's Algorithm to find a minimum spanning tree for a given connected weighted graph.
• Understand how to solve application problems by finding a minimum (or maximum) spanning tree.