22 Sept 2014

Math 181

Exam 1 Review Guide

You can check your grades by going to my website and clicking the "Check Grades" link.

Next time, come with questions that you would like me to answer about the exam. I can work practice problems on the board, but only if you come with specific questions.

Euler Circuits

Definitions/Theorems: Graph, vertex, edge, valence, path, circuit, connected, components, Euler circuit, eulerization, digraph, Traveling Salesman Problem, Chinese Postman Problem, Euler Circuit Theorem.

Be able to/Know how to:

1. recognize properties of that graph. (Is it connected? What are the vertex valences? How many edges?)
2. apply the Euler Circuit Theorem (check all hypotheses).
3. find an eulerization of a graph (Solving the Chinese Postman Problem).

Good practice problems: Pages 23–25, exercises 1–30.

Graph Coloring

Definitions/Theorems: Vertex coloring, proper vertex coloring, complete graph, cycle, chromatic number, plane graph, faces, Four Color Theorem.

Be able to/Know how to:

1. determine the chromatic number of a graph (two steps)
2. given a table of conflicts, obtain the corresponding graph. (What are the vertices? What are the edges? What do colors represent?)
3. what configurations within a graph require "more" colors to be used? (complete graphs, odd cycles, vertex adjacent to everything)

Good practice problems: Pages 108–112, exercises 71, 72, 79, 80, 85.

Pigeonhole Principle/Ramsey Theorey

Definitions/Theorems: Pigeonhole Principle, Ramsey number $R(p, q)$, Ramsey's Theorem, "Remainder" Lemma from Sept 19.

Be able to/Know how to:

1. apply Ramsey's Theorem (small values of p and q).
2. confidently state and apply the definition of Ramsey numbers.
3. determine how many objects are necessary to reach a "pigeonhole" type threshold.

Good practice problems:

Review the argument that $R(3, 3) = 6$.

If I choose $N + 1$ random integers from a set of $2N$ consecutive integers, prove that some pair differs by exactly N.

Twenty people are to sit in a row of 25 chairs. Prove that four consecutive chairs are sure to be occupied.

Other similar problems from the Sept 17 handout and Sept 19 notes.