No homework is due next week due to the Test on 3/4. However, the following concepts and problems may be helpful to review. Of course, I’m including many more problems here than will actually be on the test.

1. Counting and basic probability (Chapter 7 and section 6.1)

Topics:

- You should be familiar with the four basic types of counting problems (order mattering vs. not mattering and repetition allowed vs. not allowed). In particular, you should be able to take a word problem and translate it into a counting problem, identify what class that counting problem falls into, and use the appropriate formula.
- You should be able to convert some probability problems into counting problems which can then be approached by the combinatorial tools learned elsewhere in the chapter.
- You should be able to use the principle of inclusion-exclusion to solve counting problems both similar to the derangements problem and similar to the other problems done in lecture (see the lecture notes posted on the course site).
- You should be able to state the binomial theorem and use it to find specific coefficients in the expansion of some expressions.

Sample problems would include:

- Chapter 7 review exercises, problems 6, 8, 16, 20
- Section 7.3, problem 5
- Section 6.1, problem 5
- Find the number of arrangements of the letters in MEDIAN so that none of the vowels are in their correct position (the consonants may or may not be in the right position).

2. Graph Theory (sections 9.2, 9.3, 10.1, 10.2, 10.4, 12.1)

Topics:

- You should be comfortable with some of the basic terms, including (but not limited to) degree, bipartite, subgraph, complete, circuit, trail.
- You should know the relationship between the degrees of a graph’s vertices and the number of edges in the graph (prop. 9.2.5), and how to apply it to determine properties of certain graphs.
- You should know what it means for two graphs to be isomorphic, and be able to show that a given pair of graphs are either isomorphic (by finding a specific isomorphism) or are not (by finding some property which is different for the graphs in question).
- You should know what an Eulerian circuit/trail is, be able to find whether a graph has one or not, and, if it has one, to find it.
- You should know what a Hamiltonian cycle/path is, and be able to explain why some small graphs have or do not have the cycle (e.g., by finding the cycle, or using Dirac’s theorem).
• You should be able to find the shortest path between two vertices in a graph using Dijkstra’s algorithm
• You should be comfortable with some of the basic definitions and properties of trees, including (but not limited to) tree, root, leaf, and the number of edges in a tree

Sample problems would include:

• Section 9.2, problems 21a and 21c
• Section 9.3, problem 5a
• Section 10.1, problem 7
• Section 10.2, problems 3d, 3h, 4
• Given the graph in problem 2 of section 10.4, use any version of Dijkstra’s algorithm to find a shortest path from A to D
• Suppose that every vertex of a tree has degree either 1 or 3. If exactly 20 of the vertices have degree 3, how many have degree 1?