

The purpose of this handout is to help you study by listing the concepts, definitions, and results you will need to know for the midterm.

Midterm Information. The midterm will be on Friday, March 1, 2002. You will **not** be allowed to bring in any notes, use the text book, or use a calculator. If a question involves a calculation you may leave it in an unexpanded form, e.g., you can write 5^4 instead of 625, or $C(6, 3)$ instead of 20.

Material Covered. The exam will cover all the material discussed in class about Section 4.6, Chapter 5, Chapter 6, and the start of Chapter 7. The exam will not explicitly test you about the material covered in the last exam. However, I will assume that you are familiar with this material.

Below, I have given a breakdown of what you will need to know from each section.

1. **Section 4.6** You will required to know how to count permutations and combinations with repetitions. As well, you should be able to answer questions like Example 6. As well, you should know Theorem 3, and be able to do questions like Example 8.
2. **Section 5.1** Know the definition of a recurrence relation, and be able to determine if a sequence is a solution of a recurrence relation. Furthermore, you will need to do know how to do problems like Example 6, that is, how to find recurrence relations for specific problems. You will also need to know how to use the iterative approach.
3. **Section 5.2** In this section, you will only need to know all the material up to, and including Example 5. You can ignore the rest of the section. Make sure you know how to solve recurrence relations using Theorem 1 and Theorem 2.
4. **Section 5.5** Know the Principle of Inclusion-Exclusion, and how to use it.
5. **Section 6.1** You will need to know the definition of a relation. You will also be required to know the definitions for reflexive, symmetric, antisymmetric, and transitive. In particular, you should be able to explain why a relation has one or more of these properties. You will also need to know how to combine relations, as well as the definition of a composite of two relations.
6. **Section 6.2** Know what a n -ary relation is, and what the projection map is.
7. **Section 6.3** You should be able to associate to a relation a zero-one matrix. Moreover, you should be able to describe how we can use a matrix to determine if a relation is reflexive, symmetric, or antisymmetric. You will also be required to know how to use the matrices of two relations R_1 and R_2 to find the matrices associated to the relations $R_1 \cap R_2$, $R_1 \cup R_2$, and $R_2 \circ R_1$. For details on this, you can see Section 2.6. This section also describes how to form the Boolean product of two zero-one matrices.
8. **Section 6.5** Know the definition of an equivalence relation, as well as an equivalence class. Be able to do problems like those assigned for homework.
9. **Section 6.6** Know the definition of a partial order, poset, total order, and well order. You should know some examples of each type of ordering. As well, you will need to now how to use lexicographic ordering.
10. **Section 7.1** Be able to distinguish between a simple graph, multi-graph, pseudograph, directed graph, and directed multi-graph. You should be able to do problems like 1-9 of Section 7.1.
11. **Section 7.2** You will be required to know all the terms used to describe graphs, for example, degree, endpoints, etc. You should also be able to come up with examples of each term. As well, you should know Theorem 1 and 3. You will also need to know the names describing some simple graphs, e.g., cycle, complete, as well as bipartite graphs, and how to form the union of two graphs. You should be able to do problems like 1-4, 6-10, 12-18, 20, and 30-32 of Section 7.2.