

DISCRETE MATHEMATICS

Math 245

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Suggestions for preparing for the Fifth Exam

* indicates level 2 problems.

I. Functions and relations. Be able to do the following.

- Define these terms.
 - Relation, inverse of a relation.
 - Function. Injective (one-to-one), surjective (onto) and bijective functions.
- Use a list of elements, an arrow diagram, a table, a graph, or a formula to define a function or relation.
- Determine whether a given relation is a function, and whether a given function is injective or surjective.
- Find the inverse relation of a function. Is it a function, injective, surjective?
- Give examples of functions satisfying various properties (see 7.2 #9 in 3rd and 4th Ed., 7.3 #5 in 2nd Ed.).
- Be able to compute the composition of two functions.
- * Prove statements about functions (see problems §7.3 #16-19 4th Ed., §7.4 #16-19 3rd Ed., §7.5 #15-18 2nd Ed.)

II. Relations on a set. Be able to do the following.

- Define terms!
 - Reflexive, symmetric, transitive.
 - Equivalence relation, equivalence class.
 - Partial order. Comparable, total order, maximal, minimal, least, greatest.
- Use arrow diagrams, tables, graphs and lists of elements to represent a relation.
- Verify or prove that a given relation R is (or is not) symmetric.
- Ditto for reflexive, transitive, equivalence relation, partial order.
- Ditto for irreflexive, antisymmetric, asymmetric (but I will give you the definition).
- For a relation R on A , be able to find the smallest relation containing R which is symmetric (ditto for reflexive, transitive, an equivalence relation, a partial order).
- Know the standard examples of equivalence relations (mod n , and *exercises 8.3 #20, 21, 25, 28, 29, 31 4th Ed., 10.3 #18, 19, 22, 23, 25, 28 3rd Ed., 10.3 #15, 16, 19, 20, 22, 24, 25 2nd Ed.).

- Know the standard examples of partially ordered sets: \leq for the integers (or rationals) divides on the integers; $\mathcal{P}(\mathcal{A})$ for a set A ; D_n ; (§8.5 #16-21 4th Ed., 10.5 #16-21 2nd and 3rd Eds.).
- Draw Hasse diagrams for a poset. Find minimal and maximal elements of a poset.