

DISCRETE MATHEMATICS

Math 245

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Suggestions for preparing for the Third Exam

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

- Define 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 (or graph), or a formula to define a function or relation.
- Determine whether a given relation is a function, or 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 3rd and 4th Ed., 7.3 #5 2nd Ed.).
- Be able to compute the composition of two functions. See also problems §7.3 13-19 4th Ed., §7.4 #16-19 3rd Ed., §7.5 #15-18 2nd Ed.

III. 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.
- Verify or prove that a given relation R is symmetric (or reflexive, or transitive, or an equivalence relation, or a partial order).
- Verify that a given relation is irreflexive, or antisymmetric, or asymmetric (but I will give you the definition).
- Use tables, directed graphs, and lists of elements to represent a relation.
- 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, 28-33 4th Ed., 10.3 #18, 19, 22, 23, 25, 27-29 3rd Ed., 10.3 #15, 16, 19, 20, 22, 25-26 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 3rd and 2nd Eds.).
- Draw Hasse diagrams for a poset. Find minimal and maximal elements of a poset.