

Exam I Information

Modern Algebra 1 - Math 414 Fall 2009

When: Thursday, October 1

Will cover Sections 2, 4, 5, 6, 8, 9

What to know:

Section 2: Binary operations. Give examples of binary operations. Be able to show that a given assignment is or is not a binary operation on a given set. Be able to show that a given assignment is or is not well-defined.

Section 4: Groups. Give the definition of a group PRECISELY (Definition 4.1). Give examples of many different settings in which groups arise (e.g. numbers, functions, matrices, ...). Give examples of binary operations which are or are not groups. Know what "identity element", "inverse", "abelian" mean. Prove certain properties of groups (e.g. Theorems 4.15 through 4.17.)

Section 5: Subgroups. Give the definition of a subgroup. Provide examples. Know Theorem 5.14, on how to show a given subset is a subgroup. Then use Theorem 5.14 in specific cases, as was done in class and in the homework. Give the definition of the cyclic subgroup $\langle a \rangle$ generated by a . Compute such subgroups in specific situations.

Section 6: Cyclic groups. Give the definition of the order of an element. Find the order of an element in a group. Know the statement of Theorem 6.6 and Theorem 6.10.

Section 8: Permutation groups. Know the ideas in the proof of the fact that S_A is a group for any set A . Be able to write down a given permutation of the set $\{1, 2, \dots, n\}$ in "longhand" form. Be familiar with certain subgroups of S_n ; for instance, D_n , the group of symmetries of the regular n -gon.

Section 9: Properties of permutations. Be able to write a given permutation as a product of disjoint cycles. Then write it as a product of transpositions. Be able to use cycle notation. Give the definition of an even permutation, and of an odd permutation. For a given permutation, be able to determine whether or not it is even or odd. Prove that $A_n \leq S_n$ for any integer n .

Please review your notes and homework solutions FIRST. ONLY THEN should you try the Practice Exam. Please use the Practice Exam as an indication of the topics about which you need additional study. It should NOT be used as a guide to what Exam I will actually look like.