

ABSTRACT ALGEBRA 1 (MATH 3140): REVIEW SHEET

- II. (a) The sign of a permutation in S_n . The Cauchy number.
(b) Conjugacy in S_n .
(c) An abelian group is simple if and only if it is isomorphic to C_n for some n .
(d) Finite simple groups have been classified. Some nonabelian examples include A_n for $n \geq 5$ and $\text{PSL}(n, q)$ for most choices of $n > 1$ and q a prime power.
(e) Short exact sequences. Sequences split on the left or right.
(f) Reconstructing the middle group from the groups on the ends in

$$1 \rightarrow K \xrightarrow{i} G \xrightarrow{\mu} G/K \rightarrow 1.$$

We discussed direct products, semidirect products, and factor systems.

- (g) Jordan-Hölder Theorem.
(h) Second Isomorphism Theorem.
(i) Fundamental Theorem of Finite Abelian Groups. Elementary divisor form. Invariant factor form.
(j) The order statistics determine the isomorphism type of a finite abelian group.
(k) Third Isomorphism Theorem.
(l) The Correspondence Theorem.

General advice on preparing for a math test.

Be prepared to demonstrate understanding in the following ways.

- (i) Know the definitions of new concepts, and the meanings of the definitions.
(ii) Know the statements and meanings of the major theorems.
(iii) Know examples/counterexamples. (The purpose of an example is to illustrate the extent of a definition or theorem. The purpose of a counterexample is to indicate the limits of a definition or theorem.)
(iv) Know how to perform the different kinds of calculations discussed in class.
(v) Be prepared to prove elementary statements. (Understanding the proofs done in class is the best preparation for this.)
(vi) Know how to correct mistakes made on old HW.