

Math 817 Review Sheet #2

A (not necessarily complete) list of important things to know for the Final Exam

Group Automorphisms: Definition, automorphism group of cyclic group, automorphism group of \mathbb{Z}/n^\times .

Direct Products: Definition of direct products, recognition theorem for direct products, internal direct products.

Semidirect Products: Definition of semidirect products, recognition theorem for semidirect products, internal semidirect products, uniqueness theorem.

Free Groups: Definition, universal mapping property.

Presentations: Definition, universal mapping property, how to find a presentation, how to prove a presentation is correct.

Sylow's Theorem: Statements, applications to simple groups, applications of classifying groups of a given order.

Conjugacy classes: Class equation, applications to simple groups and p -groups, conjugacy classes in symmetric and alternating groups.

Fundamental Theorem of Finitely Generated Abelian Groups: Invariant factor form, elementary divisor form, rank.

Examples of Rings: Commutative, noncommutative, matrix rings, fields, domains, polynomial rings.

Special elements: Unit, nilpotent, idempotent, zerodivisor, irreducible, prime.

Ideals: Definition, sums and (finite) products of ideals, principal ideals, maximal ideals, prime ideals, kernels of ring of homomorphisms.

Quotient rings: Isomorphism theorems, determining when an ideal is maximal or prime.

Division theorem for polynomial rings: Statement and proof, applications to roots, polynomial ring over a field is a PID.

PIDs: Examples and nonexamples. Proof that every irreducible element is prime in a PID.

UFDs: Definition, examples and nonexamples, theorem for when a Noetherian domain is a UFD.