Algebra Syllabus
Spring 2004

Each bullet is a week.

• Conjugacy as tribal affiliation. 2.6. Normal Subgroups and Quotient Groups. We define normal subgroup as, contains no “partial tribes”. We can mod out by these.

•• 2.7. Homomorphisms. We’ve done some of this with isomorphisms, and some on exams. Prove kernel is normal, and Theorem 2.7.1 (first isomorphism theorem). Omit applications 1 and 2. Prove Lemma 2.7.5 (homomorphism correspondence theorem), and Theorem 2.7.2 (second isomorphism theorem).

• 3.1. Definitions and Examples of Rings. 3.2. Some Special Classes of Rings.

• 3.3. Homomorphisms. 3.4. Ideals and Quotient Rings.

• 3.5. More Ideals and Quotient Rings. 3.6. The Field of Quotients of an Integral Domain. Theorem 3.5.1. $m$ maximal implies $R/m$ is a field.

• 3.7. Euclidean Rings. 3.9. Polynomial Rings. We omit Gaussian integers, and the theorem that every prime of form $4n + 1$ is a sum of two squares.

•• 5.1. Extension Fields. We assume some linear algebra for basis and dimension. We prove multiplicativity of degree, and Theorem 5.2.2, algebraic defines finite extension, Theorem 5.1.3, degree of element equals degree of extension, Theorem 5.1.4, algebraic elements form a field, Theorem 5.1.5, algebraic over algebraic is algebraic.

•• 5.3. Roots of Polynomials. Splitting fields: finding roots of polynomials in extension fields. We prove Theorem 5.3.4, splitting fields for the same polynomial are isomorphic.

•• 5.4. Constructions with Straightedge and Compass.