

MATH 201A -- Algebra

Algebra Math 201A

Groups

1. Semigroups, Monoids, and Groups
2. Homomorphisms and Subgroups
3. Cosets and Counting
4. Normality, Quotient Groups, and Homomorphisms
5. Symmetric, Alternating, and Dihedral Groups
6. Categories: Products, Coproducts, and Free Objects
7. Direct Products and Direct Sums
8. Free Groups, Free Products, Generators & Relations

The Structure of Groups

1. Free Abelian Groups
2. Finitely Generated Abelian Groups
3. The Action of a Group on a Set
4. The Sylow Theorems
5. Classification of Finite Groups
6. Solvable Groups
7. Normal and Subnormal Series

Rings

1. Rings and Homomorphisms
2. Ideals
3. Factorization in Commutative Rings
4. Rings of Quotients and Localization

References

1. T. W. Hungerford, Algebra, Springer-Verlag, New York, 1974. Chapter 1, sections 1-6 of Chapter 2.
2. N. Jacobson, Basic Algebra I, W. H. Freeman and Company, San Francisco, 1974, Chapter 1.
3. S. Lang, Algebra, Addison-Wesley, Menlo Park, CA, 1984, Chapter 1.

On materials in appendices extra homework assignments and class presentations are part of outside research.

MATH 201B -- Algebra

Algebra 201B

Rings

1. Rings of Polynomials and Formal Power Series
2. Factorization in Polynomial Rings

References

1. T. W. Hungerford, Algebra, Chapter 3 and sections 1,5 of Chapter 5
2. N. Jacobson, Basic Algebra I, Chapter 2 and sections 1, 13 of Chapter 4
3. S. Lang, Algebra, Chapter 2 and sections 1, 5 of Chapter 7

Modules

1. Modules, Homomorphisms and Exact Sequences
2. Free Modules and Vector Spaces
3. Projective and Injective Modules
4. Hom Duality
5. Tensor Products
6. Modules over a Principal Ideal Domain
7. Applications to Rational and Jordan Canonical Forms of Matrices
8. Basic properties of the Tensor Algebra, Symmetric Algebra, and Exterior Algebra

References

1. Serge Lang, Linear Algebra, Springer-Verlag, New York
2. T. W. Hungerford, Algebra, Sections 1-6 of Chapter 4 and Chapter 7
3. N. Jacobson, basic Algebra I, Chapter 3
4. S. Lang, Algebra, Sections 1-6 of Chapter 3, sections 1-6 of chapter 13 and Chapter 15

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MATH 201C -- Algebra

Algebra Math 201C

Fields and Galois Theory

1. Field Extensions - Ruler and Compass Constructions
2. The Fundamental Theorem - Symmetric Rational Functions
3. Splitting Fields, Algebraic Closure, and Normality - The Fundamental Theorem of Algebra
4. The Galois Groups of a Polynomial
5. Finite Fields
6. Separability
7. Cyclic Extensions
8. Cyclotomic Extensions
9. Radical Extensions - The General Equation of Degree n

The Structure of Fields

1. Transcendence Bases
2. Linear Disjointness and Separability

References

1. T. W. Hungerford, Algebra, Chapter 3 and sections 1, 5 of Chapter 5
2. N. Jacobson, Basic Algebra I, Chapter 2 and sections 1, 13 of Chapter 4
3. S. Lang, Algebra, Chapter 2 and sections 1, 5 of Chapter 7

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