

Ph D Program Entrance Examination--Algebra

Note: The examination is based on the topics in the outline and not on any specific texts or the contents of any specific course taught at ,WVU.

I. GROUPS

Basic properties, subgroups, normal subgroups, quotient groups, homomorphisms, fundamental isomorphism theorems, cyclic groups, permutation groups, direct sums, Sylow theorems, solvable groups.

References: Hungerford, Algebra, Chapters I and II
Jacobson, Basic Algebra I, Chapter I, section 4.6
Lang, Algebra, Chapter I

II. RINGS

Basic properties, subrings, ideals, quotient rings, homomorphisms, fundamental isomorphism theorems, principal ideal domains, unique factorization domains, Euclidean domains, polynomial rings, direct sums.

References: Hungerford, Algebra, Chapter III
Jacobson, Basic Algebra I, Chapter 2
Lang, Algebra, Chapters II and V

III. MODULES

Basic properties, free modules, submodules, quotient modules, homomorphisms, fundamental isomorphism theorems, direct sums.

References: Hungerford, Algebra, Chapter IV
Jacobson, Basic Algebra I, Chapter 3
Lang, Algebra, Chapter III

IV. FIELDS

Field extensions, splitting field, Galois group of a polynomial, fundamental theorem of Galois theory, solvability by radicals.

References: Hungerford, Algebra, Chapter V
Jacobson, Basic Algebra I, Chapter 4
Lang, Algebra, Chapters VII and VIII