

Pre-requisites for AFS-III at Pune 2014

March 17, 2014

Algebra

Groups: Groups, subgroups, normal subgroups, quotient groups, homomorphism of groups, fundamental homomorphism theorems, (Noether isomorphism), abelian groups, cyclic groups, finite direct product of abelian groups, permutation group S_n and alternating group A_n and their subgroups for $n \leq 4$, simplicity of A_n for $n \geq 5$, Sylow Theorems, free group, generators and relations.

Rings and Fields: Definition and examples of rings, commutative rings with identity, ideals, quotient rings, integral domains and fields, fundamental theorems of homomorphism for commutative rings, prime ideals, maximal ideals, units, field of fractions of an integral domain, chinese remainder theorem, factorization, euclidean domains, principal ideal domains and unique factorization domains, (with special emphasis to integers and polynomial rings), Gauss lemma, Eisenstein's irreducibility criterion, characteristic of a ring and a field, modular arithmetic (congruences), the ring Z/nZ and its units.

Algebra by E. Artin, is a good reference for the above topics. However, you may choose to read your own favourite book(s).

Analysis We presume that all of you have gone through a course in real analysis and a course in complex analysis. Get familiar with first eight chapters of Rudin's 'Principles of Mathematical Analysis'. Also, get familiar with some basic properties of complex numbers, for examples as given in the first chapter of 'Basic Complex Analysis of One Variable' by A. R. Shastri. You are welcome to read further chapters also in this book if your time permits.

Topology Here you need to have a good grasp of point-set- topology. A good reference is Munkre's book 'Topology-A first course'. Familiarity with the first four chapters of this book is a must. You may try to glance through chapter 7 and 8 as well. In the algebraic topology course, you will see that you need a lot of algebra background as outlined above.