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Abelian Varieties with Complex Multiplication and Modular Functions. By Goro Shimura. Princeton University Press, New Jersey 1998. xiv, 218 pp. $ 39.50 ISBN 0-691-01656-9.

Preface – Preface to *Complex Multiplication of Abelian Varieties and Its Applications to Number Theory (1961)* – Notation and Terminology – Chapter 1. Preliminaries on Abelian Varieties. Homomorphisms and divisors – Differential forms – Analytic theory of abelian varieties – Fields of moduli and Kummer varieties – Chapter 2. Abelian Varieties with Complex Multiplication. Structure of endomorphism algebras – Construction of abelian varieties with complex multiplication – Transformations and multiplications – The reflex of a CM-type – Chapter 3. Reduction of Constant Fields. Reduction of varieties and cycles – Reduction of rational mappings and differential forms – Reduction of abelian varieties – The theory "for almost all $\mathfrak{p}$" – The prime ideal decomposition of an $N(\mathfrak{p})$-th power homomorphism – Chapter 4. Construction of Class Fields. Polarized abelian varieties of type $(K;\{\phi_i\})$ – The unramified class field obtained from the field of moduli – The class fields generated by ideal-section points – The field of moduli in a generalized setting – The main theorem of complex multiplication in the adelic language – Chapter 5. The Zeta-Function of an Abelian Variety with Complex Multiplication. The zeta function relative to a field over which some endomorphisms are defined – The zeta function over smaller fields – Models over the field of moduli and models with given Hecke characters – The case of elliptic curves – Chapter 6. Families of Abelian Varieties and Modular Functions. Symplectic and unitary groups – Families of polarized abelian varieties – Modular forms and functions – Canonical models – Chapter 7. Theta Functions and Periods on Abelian Varieties. Theta functions – Proof of Theorem 27.7 and Proposition 27.9 – Theta functions with complex multiplication – The periods of differential forms on abelian varieties – Periods in the Hilbert modular case – Periods on abelian varieties with complex multiplication and their algebraic relations – Proof of Theorem 32.4 – Bibliography – Supplementary References – Index

A Course in Homological Algebra. By P. J. Hilton and U. Stammbach. Second Edition. Springer Verlag, New York 1997. xii, 364 pp. sFr. 70.00 ISBN 0-387-94823-6.

Preface to the Second Edition – Introduction – Chapter 1. Modules. Modules – The Group of Homomorphisms – Sums and Products – Free and Projective Moduls – Projective Moduls over a Principal Ideal Domain – Dualization, Injective Modules – Injective Modules over a Principal Ideal Domain – Cofree Modules – Essential Extensions – Chapter 2. Categories and Functors. Categories – Functors – Duality – Natural Transformations – Products and Coproducts; Universal Constructions – Universal Constructions (Continued); Pull-backs and Push-outs – Adjoint Functors – Adjoint Functors and Universal Constructions – Abelian Categories – Projective, Injective, and Free Objects – Chapter 3. Extensions of Moduls. Extensions – The Functor Ext – Ext Using Injectives – Computation of some Ext-Groups – Two Exact Sequences – A Theorem of Stein-Serre for Abelian Groups – The Tensor Product – The Functor Tor – Chapter 4. Derived Functors. Complexes – The Long Exact (Co)Homology Sequence – Homotopy – Resolutions – Derived Functors – The Two Long Exact Sequences of Derived Functors – The Functors Ext^n_Λ Using Projectives – The Functors $\overline{\mathrm{Ext}}^n_\Lambda$ Using Injectives – Ext^n and n-Extensions – Another Characterization of Derived Functors – The Functor Tor^Λ_n – Change of Rings – Chapter 5. The Künneth Formula. Double Complexes – The Künneth Theorem – The Dual Künneth Theorem – Applications of the Künneth Formulas – Chapter 6. Cohomology of Groups. The Group Ring – Definition of (Co)Homology – H^0, H_0 – H^1, H_1 with Trivial Coefficient Modules – The Augmentation Ideal, Derivations, and the Semi-Direct Product – A Short Exact Sequence – The (Co)Homology of Finite Cyclic Groups – The 5-Term Exact Sequences – H_2, Hopf's Formula, and the Lower Central Series – H^2 and Extensions – Relative Projectives and Relative Injectives – Reduction Theorems – Resolutions – The (Co)Homology of a Coproduct – The Universal

Coefficient Theorem and the (Co)Homology of a Product – Groups and Subgroups – Chapter 7. Cohomology of Lie Algebras. Lie Algebras and their Universal Enveloping Algebra – Definition of Cohomology; H^0, $H^1 - H^2$ and Extensions – A Resolution of the Group Field K – Semi-simple Lie Algebras – The two Whitehead Lemmas – Appendix: Hilbert's Chain-of-Syzygies Theorem – Chapter 8. Exact Couples and Spectral Sequences. Exact Couples and Spectral Sequences – Filtered Differential Objects – Finite Convergence Conditions for Filtered Chain Complexes – The Ladder of an Exact Couple – Limits – Rees Systems and Filtered Complexes – The Limit of a Rees System – Completions of Filtrations – The Grothendieck Spectral Sequence – Chapter 9. Satellites and Homology. Projective Classes of Epimorphisms – $\mathscr{E}$-Derived Functors – $\mathscr{E}$-Satellites – The Adjoint Theorem and Examples – Kan Extensions and Homology – Applications: Homology of Small Categories, Spectral Sequences – Chapter 10. Some Applications and Recent Developments. Homological Algebra and Algebraic Topology – Nilpotent Groups – Finiteness Conditions on Groups – Modular Representation Theory – Stable and Derived Categories – Bibliography – Index

Theorie der endlichen Gruppen. Eine Einführung. By Hans Kurzweil and Bernd Stellmacher. Springer-Verlag, Berlin Heidelberg 1998. 341 pp., 1 fig.; DM 44.00 - ISBN 3-540-60331-X

Dieses Lehrbuch bietet einen modernen Zugang zur Theorie der endlichen Gruppen. Ohne große Vorkenntnisse wird der Leser mit den Grundlagen der Theorie vertraut gemacht und dann zu neueren Entwicklungen in der Gruppentheorie hingeführt, die unter dem Stichwort "lokale Strukturtheorie" zusammengefaßt werden können. Dabei berücksichtigen die Autoren die folgenden zwei Gesichtspunkte in besonderem Maße: Zum einen geben sie einen Einblick in eine Theorie, die völlig aus sich heraus eine Vielfalt an Methoden und Begriffen entwickelt hat und schließlich Anfang der achtziger Jahre zur Klassifikation der endlichen einfachen Gruppen führte. Zum anderen machen sie deutlich, daß diese Theorie weder abgeschlossen noch vollendet ist, sondern auch nach dieser Klassifikation weiterlebt und sich weiterentwickelt.

Grundlagen – Abelsche Gruppen – Operieren und Konjugieren – Permutationsgruppen – Normal- und Subnormalteilerstruktur – Verlagerung und p-Faktorgruppen – Operation von Gruppen auf Gruppen – Quadratische Operation – Einbettungen p-lokaler Untergruppen – Signalisator-Funktoren – N-Gruppen.