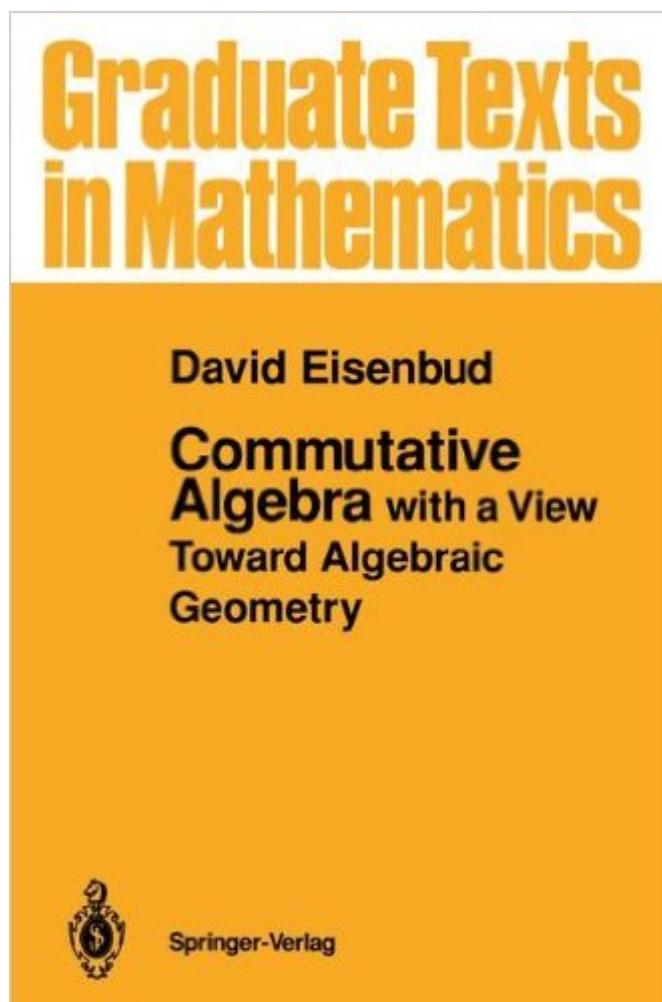


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Commutative Algebra: With A View Toward Algebraic Geometry (Graduate Texts In Mathematics)



Synopsis

This is a comprehensive review of commutative algebra, from localization and primary decomposition through dimension theory, homological methods, free resolutions and duality, emphasizing the origins of the ideas and their connections with other parts of mathematics. The book gives a concise treatment of Grobner basis theory and the constructive methods in commutative algebra and algebraic geometry that flow from it. Many exercises included.

Book Information

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Customer Reviews

If one is interested in taking on a thorough study of algebraic geometry, this book is a perfect starting point. The writing is excellent, and the student will find many exercises that illustrate and extend the results in each chapter. Readers are expected to have an undergraduate background in algebra, and maybe some analysis and elementary notions from differential geometry. Space does not permit a thorough review here, so just a brief summary of the places where the author has done an exceptional job of explaining or motivating a particular concept:(1) The history of commutative algebra and its connection with algebraic geometry, for example the origin of the concept of an "ideal" of a ring as generalizing unique factorization.(2) The discussion of the concept of localization, especially its origins in geometry. A zero dimensional ring (collection of "points") is a ring whose primes are all maximal, as expected.(3) The theory of prime decomposition as a generalization of unique prime factorization. Primary decomposition is given a nice geometric interpretation in the

book.(4) Five different proofs of the Nullstellensatz discussed, giving the reader good insight on this important result.(5) The geometric interpretation of an associated graded ring corresponding to the exceptional set in the blowup algebra.(6) The notion of flatness of a module as a continuity of fibers and a test for this using the Tor functor.(7) The characterization of Hensel's lemma as a version of Newton's method for solving equations. The geometric interpretation of the completion as representing the properties of a variety in neighborhoods smaller than Zariski open neighborhoods.(8) The characterization of dimension using the Hilbert polynomial.

People tend to have strong feelings about this book. In my opinion, the people who dislike it are those who expect it to be like a typical graduate-level math book. This book is extremely atypical for a math book; it's not meant to be read linearly, and the topics in it do not follow a typical logical dependency. Personally, I find it to be outstanding; my only complaint about it is that I wish there were more books like it! Commutative algebra and algebraic geometry are extremely difficult subjects requiring a great deal of background. This book is written as a sort of intermediary text between introductory abstract algebra books with a full and exposition of algebraic structures, and advanced, highly technical texts that can be difficult to follow and grasp on a technical level. As such, this book focuses on developing intuition, and discussing the history and motivation behind the various mathematical structures presented. It assumes that most of the other aspects of the subject, including both the elementary expositions, and the more advanced technical details, can be found elsewhere (although, believe me, this book certainly has its share of both elementary expositions and advanced technical details!) I think this book is actually better for self-study than for use as a textbook. Most of the people I have known who have used it as a textbook have been frustrated with it. Either way, it needs to be supplemented by other books. Personally, on algebra, I like the Dummit and Foote, Isaacs, and Lang books. Those three books have very little overlap with each other, and very little overlap with this book, and they offer a very useful difference of perspectives where they do overlap!

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