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# Algebraic Geometry And Commutative Algebra

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Graduate Algebra: Commutative View

Free Resolutions in Commutative Algebra and Algebraic Geometry

Local Algebra

Computational Methods in Commutative Algebra and Algebraic Geometry

Free Resolutions in Commutative Algebra and Algebraic Geometry

Combinatorial Aspects of Commutative Algebra and Algebraic Geometry

Ideals, Varieties, and Algorithms

Algebraic Geometry and Commutative Algebra

Connections Between Algebra, Combinatorics, and Geometry

A Singular Introduction to Commutative Algebra

Commutative Algebra, Algebraic Geometry, and Computational Methods

Ideals, Varieties, and Algorithms

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Commutative Algebra and Algebraic Geometry  
Ideals, Varieties, and Algorithms  
Approximate Commutative Algebra  
Commutative Algebra  
Number Theory, Algebraic Geometry and Commutative Algebra  
An Introduction to Commutative Algebra  
Combinatorial Commutative Algebra  
Algebraic  $K$ -Theory, Commutative Algebra, and Algebraic Geometry  
Commutative Algebra  
Introduction to Commutative Algebra and Algebraic Geometry  
An Algebraic Introduction to Complex Projective Geometry  
Commutative Algebra  
Introduction to Algebraic Geometry and Commutative Algebra  
Algebraic Geometry and Commutative Algebra  
Introduction to Commutative Algebra and Algebraic Geometry  
Algebraic Geometry for Associative Algebras  
Undergraduate Commutative Algebra  
Commutative Algebra and Noncommutative Algebraic Geometry  
Commutative Algebra  
Non-commutative Algebraic Geometry

Introduction To Algebraic Geometry And Commutative Algebra  
Ideals, Varieties, and Algorithms  
Commutative Algebra and Noncommutative Algebraic Geometry  
Algebraic Geometry and Commutative Algebra  
Homological and Computational Methods in Commutative Algebra

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**HUERTA JAMARCUS**

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*Graduate Algebra: Commutative View*  
Springer

Commutative algebra, combinatorics, and algebraic geometry are thriving areas of mathematical research with a rich history of interaction. *Connections Between Algebra and Geometry* contains lecture notes, along with exercises and solutions, from the Workshop on *Connections Between Algebra and*

*Geometry* held at the University of Regina from May 29-June 1, 2012. It also contains research and survey papers from academics invited to participate in the companion Special Session on *Interactions Between Algebraic Geometry and Commutative Algebra*, which was part of the CMS Summer Meeting at the University of Regina held June 2-3, 2012, and the meeting *Further Connections Between Algebra and Geometry*, which was held at the North Dakota State University February 23, 2013. This volume highlights three mini-

courses in the areas of commutative algebra and algebraic geometry: differential graded commutative algebra, secant varieties, and fat points and symbolic powers. It will serve as a useful resource for graduate students and researchers who wish to expand their knowledge of commutative algebra, algebraic geometry, combinatorics, and the intricacies of their intersection.

Free Resolutions in Commutative Algebra and Algebraic Geometry

American Mathematical Soc.

This substantially enlarged second edition aims to lead a further stage in the computational revolution in commutative algebra. This is the first handbook/tutorial to extensively deal with SINGULAR. Among the book's most distinctive features is a new, completely

unified treatment of the global and local theories. Another feature of the book is its breadth of coverage of theoretical topics in the portions of commutative algebra closest to algebraic geometry, with algorithmic treatments of almost every topic.

**Local Algebra** Springer

The purpose of this book is twofold: to present some basic ideas in commutative algebra and algebraic geometry and to introduce topics of current research, centered around the themes of Gröbner bases, resultants and syzygies. The presentation of the material combines definitions and proofs with an emphasis on concrete examples. The authors illustrate the use of software such as Mathematica and Singular. The design of the text in each chapter

consists of two parts: the fundamentals and the applications, which make it suitable for courses of various lengths, levels, and topics based on the mathematical background of the students. The fundamentals portion of the chapter is intended to be read with minimal outside assistance, and to learn some of the most useful tools in commutative algebra. The applications of the chapter are to provide a glimpse of the advanced mathematical research where the topics and results are related to the material presented earlier. In the applications portion, the authors present a number of results from a wide range of sources without detailed proofs. The applications portion of the chapter is suitable for a reader who knows a little commutative algebra and algebraic

geometry already, and serves as a guide to some interesting research topics. This book should be thought of as an introduction to more advanced texts and research topics. Its novelty is that the material presented is a unique combination of the essential methods and the current research results. The goal is to equip readers with the fundamental classical algebra and geometry tools, ignite their research interests, and initiate some potential research projects in the related areas.

**Computational Methods in Commutative Algebra and Algebraic Geometry** Springer Science & Business Media

Algebraic geometry is a fascinating branch of mathematics that combines methods from both, algebra and

geometry. It transcends the limited scope of pure algebra by means of geometric construction principles. Moreover, Grothendieck's schemes invented in the late 1950s allowed the application of algebraic-geometric methods in fields that formerly seemed to be far away from geometry, like algebraic number theory. The new techniques paved the way to spectacular progress such as the proof of Fermat's Last Theorem by Wiles and Taylor. The scheme-theoretic approach to algebraic geometry is explained for non-experts. More advanced readers can use the book to broaden their view on the subject. A separate part deals with the necessary prerequisites from commutative algebra. On a whole, the book provides a very accessible and self-contained

introduction to algebraic geometry, up to a quite advanced level. Every chapter of the book is preceded by a motivating introduction with an informal discussion of the contents. Typical examples and an abundance of exercises illustrate each section. This way the book is an excellent solution for learning by yourself or for complementing knowledge that is already present. It can equally be used as a convenient source for courses and seminars or as supplemental literature.

[Free Resolutions in Commutative Algebra and Algebraic Geometry](#)  
Springer Nature

This book surveys fundamental current topics in these two areas of research, emphasising the lively interaction between them. Volume 1 contains

expository papers ideal for those entering the field.

Combinatorial Aspects of Commutative Algebra and Algebraic Geometry

Foundation Books

Commutative algebra is at the crossroads of algebra, number theory and algebraic geometry. This textbook is affordable and clearly illustrated, and is intended for advanced undergraduate or beginning graduate students with some previous experience of rings and fields. Alongside standard algebraic notions such as generators of modules and the ascending chain condition, the book develops in detail the geometric view of a commutative ring as the ring of functions on a space. The starting point is the Nullstellensatz, which provides a close link between the geometry of a

variety  $V$  and the algebra of its coordinate ring  $A=k[V]$ ; however, many of the geometric ideas arising from varieties apply also to fairly general rings. The final chapter relates the material of the book to more advanced topics in commutative algebra and algebraic geometry. It includes an account of some famous 'pathological' examples of Akizuki and Nagata, and a brief but thought-provoking essay on the changing position of abstract algebra in today's world.

Ideals, Varieties, and Algorithms

Springer

This book details the heart and soul of modern commutative and algebraic geometry. It covers such topics as the Hilbert Basis Theorem, the Nullstellensatz, invariant theory,

projective geometry, and dimension theory. In addition to enhancing the text of the second edition, with over 200 pages reflecting changes to enhance clarity and correctness, this third edition of *Ideals, Varieties and Algorithms* includes: a significantly updated section on Maple; updated information on AXIOM, CoCoA, Macaulay 2, Magma, Mathematica and SINGULAR; and presents a shorter proof of the Extension Theorem.

**Algebraic Geometry and Commutative Algebra** Mercury

Learning and Information

Originally published in 1985, this classic textbook is an English translation of *Einführung in die kommutative Algebra und algebraische Geometrie*. As part of the Modern Birkhäuser Classics series,

the publisher is proud to make *Introduction to Commutative Algebra and Algebraic Geometry* available to a wider audience. Aimed at students who have taken a basic course in algebra, the goal of the text is to present important results concerning the representation of algebraic varieties as intersections of the least possible number of hypersurfaces and—a closely related problem—with the most economical generation of ideals in Noetherian rings. Along the way, one encounters many basic concepts of commutative algebra and algebraic geometry and proves many facts which can then serve as a basic stock for a deeper study of these subjects.

[Connections Between Algebra, Combinatorics, and Geometry](#) Springer  
This work focuses on the association of



methods from topology, category and sheaf theory, algebraic geometry, noncommutative and homological algebras, quantum groups and spaces, rings of differential operation, Čech and sheaf cohomology theories, and dimension theories to create a blend of noncommutative algebraic geometry. It offers a scheme theor

[A Singular Introduction to Commutative Algebra](#) Cambridge University Press

This text covers topics in algebraic geometry and commutative algebra with a strong perspective toward practical and computational aspects. The first four chapters form the core of the book. A comprehensive chart in the Preface illustrates a variety of ways to proceed with the material once these chapters are covered. In addition to the

fundamentals of algebraic geometry—the elimination theorem, the extension theorem, the closure theorem and the Nullstellensatz—this new edition incorporates several substantial changes, all of which are listed in the Preface. The largest revision incorporates a new Chapter (ten), which presents some of the essentials of progress made over the last decades in computing Gröbner bases. The book also includes current computer algebra material in Appendix C and updated independent projects (Appendix D). The book may serve as a first or second course in undergraduate abstract algebra and with some supplementation perhaps, for beginning graduate level courses in algebraic geometry or computational algebra. Prerequisites for

the reader include linear algebra and a proof-oriented course. It is assumed that the reader has access to a computer algebra system. Appendix C describes features of MapleTM, Mathematica® and Sage, as well as other systems that are most relevant to the text. Pseudocode is used in the text; Appendix B carefully describes the pseudocode used. Readers who are teaching from Ideals, Varieties, and Algorithms, or are studying the book on their own, may obtain a copy of the solutions manual by sending an email to [jlittle@holycross.edu](mailto:jlittle@holycross.edu). From the reviews of previous editions: "...The book gives an introduction to Buchberger's algorithm with applications to syzygies, Hilbert polynomials, primary decompositions. There is an introduction to classical algebraic geometry with

applications to the ideal membership problem, solving polynomial equations and elimination theory. ...The book is well-written. ...The reviewer is sure that it will be an excellent guide to introduce further undergraduates in the algorithmic aspect of commutative algebra and algebraic geometry." —Peter Schenzel, zbMATH, 2007 "I consider the book to be wonderful. ... The exposition is very clear, there are many helpful pictures and there are a great many instructive exercises, some quite challenging ... offers the heart and soul of modern commutative and algebraic geometry." —The American Mathematical Monthly  
*Commutative Algebra, Algebraic Geometry, and Computational Methods*  
World Scientific

Written at a level appropriate to undergraduates, this book covers such topics as the Hilbert Basis Theorem, the Nullstellensatz, invariant theory, projective geometry, and dimension theory. Contains a new section on Axiom and an update about MAPLE, Mathematica and REDUCE.  
Ideals, Varieties, and Algorithms CRC Press

Approximate Commutative Algebra is an emerging field of research which endeavours to bridge the gap between traditional exact Computational Commutative Algebra and approximate numerical computation. The last 50 years have seen enormous progress in the realm of exact Computational Commutative Algebra, and given the importance of polynomials in scientific

modelling, it is very natural to want to extend these ideas to handle approximate, empirical data deriving from physical measurements of phenomena in the real world. In this volume nine contributions from established researchers describe various approaches to tackling a variety of problems arising in Approximate Commutative Algebra.

*Algebraic Geometry and Commutative Algebra* Springer Science & Business Media

Along the lines developed by Grothendieck, this book delves into the rich interplay between algebraic geometry and commutative algebra. With concise yet clear definitions and synopses a selection is made from the wealth of material in the disciplines

including the Riemann-Roch theorem for arbitrary projective curves."--pub. desc.

### **Ideals, Varieties, and Algorithms**

Springer

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.

Ideals, Varieties, and Algorithms CRC Press

Algebraic Geometry is a fascinating

branch of Mathematics that combines methods from both Algebra and Geometry. It transcends the limited scope of pure Algebra by means of geometric construction principles. Putting forward this idea, Grothendieck revolutionized Algebraic Geometry in the late 1950s by inventing schemes. Schemes now also play an important role in Algebraic Number Theory, a field that used to be far away from Geometry. The new point of view paved the way for spectacular progress, such as the proof of Fermat's Last Theorem by Wiles and Taylor. This book explains the scheme-theoretic approach to Algebraic Geometry for non-experts, while more advanced readers can use it to broaden their view on the subject. A separate part presents the necessary

prerequisites from Commutative Algebra, thereby providing an accessible and self-contained introduction to advanced Algebraic Geometry. Every chapter of the book is preceded by a motivating introduction with an informal discussion of its contents and background. Typical examples, and an abundance of exercises illustrate each section. Therefore the book is an excellent companion for self-studying or for complementing skills that have already been acquired. It can just as well serve as a convenient source for (reading) course material and, in any case, as supplementary literature. The present edition is a critical revision of the earlier text.

**Commutative Algebra and Algebraic Geometry** American Mathematical Soc.

- Contains many examples and problems (with hints) - Provides a good introduction for beginners in algebraic number theory and algebraic geometry  
Ideals, Varieties, and Algorithms  
Academic Press  
The Abel Symposium 2009  
"Combinatorial aspects of Commutative Algebra and Algebraic Geometry", held at Voss, Norway, featured talks by leading researchers in the field. This is the proceedings of the Symposium, presenting contributions on syzygies, tropical geometry, Boij-Söderberg theory, Schubert calculus, and quiver varieties. The volume also includes an introductory survey on binomial ideals with applications to hypergeometric series, combinatorial games and chemical reactions. The contributions

pose interesting problems, and offer up-to-date research on some of the most active fields of commutative algebra and algebraic geometry with a combinatorial flavour.

#### Approximate Commutative Algebra

Walter de Gruyter GmbH & Co KG

This volume contains papers presented at the International Conference on Commutative Algebra, Algebraic geometry, and Computational methods held in Hanoi in 1996, as well as papers written subsequently. It features both expository articles as well as research papers on a range of currently active areas in commutative algebra, algebraic geometry (particularly surveys on intersection theory) and combinatorics. In addition, a special feature is a section on the life and work of Wolfgang Vogel,

who was an organiser of the conference.

#### *Commutative Algebra* Springer

This book surveys fundamental current topics in these two areas of research, emphasising the lively interaction between them. Volume 2 focuses on the most recent research.

#### Number Theory, Algebraic Geometry and Commutative Algebra Springer Science & Business Media

This is an English translation of the now classic "Algbre Locale - Multiplicits" originally published by Springer as LNM 11. It gives a short account of the main theorems of commutative algebra, with emphasis on modules, homological methods and intersection multiplicities. Many modifications to the original French text have been made for this English edition, making the text easier to

read, without changing its intended informal character.