

# Invariant Theory of Finite Groups

Mara D. Neusel  
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American Mathematical Society

# Invariant Theory Of Finite Groups

**H.E.A. Eddy Campbell, David L. Wehlau**



## **Invariant Theory Of Finite Groups:**

**Invariant Theory of Finite Groups** Mara D. Neusel, Larry Smith, 2010-03-08 The questions that have been at the center of invariant theory since the 19th century have revolved around the following themes finiteness computation and special classes of invariants This book begins with a survey of many concrete examples chosen from these themes in the algebraic homological and combinatorial context In further chapters the authors pick one or the other of these questions as a departure point and present the known answers open problems and methods and tools needed to obtain these answers Chapter 2 deals with algebraic finiteness Chapter 3 deals with combinatorial finiteness Chapter 4 presents Noetherian finiteness Chapter 5 addresses homological finiteness Chapter 6 presents special classes of invariants which deal with modular invariant theory and its particular problems and features Chapter 7 collects results for special classes of invariants and coinvariants such as pseudo reflection groups and representations of low degree If the ground field is finite additional problems appear and are compensated for in part by the emergence of new tools One of these is the Steenrod algebra which the authors introduce in Chapter 8 to solve the inverse invariant theory problem around which the authors have organized the last three chapters The book contains numerous examples to illustrate the theory often of more than passing interest and an appendix on commutative graded algebra which provides some of the required basic background There is an extensive reference list to provide the reader with orientation to the vast literature

### **Polynomial Invariants of Finite Groups**

David J. Benson, 2014-05-14 This is the first book to deal with invariant theory and the representations of finite groups By restricting attention to finite groups Dr Benson is able to avoid recourse to the technical machinery of algebraic groups and he develops the necessary results from commutative algebra as he proceeds Thus the book should be accessible to graduate students In detail the book contains an account of invariant theory for the action of a finite group on the ring of polynomial functions on a linear representation both in characteristic zero and characteristic  $p$  Special attention is paid to the role played by pseudoreflections which arise because they correspond to the divisors in the polynomial ring which ramify over the invariants Also included is a new proof by Crawley Boevey and the author of the Carlisle Kropholler conjecture This volume will appeal to all algebraists but especially those working in representation theory group theory and commutative or homological algebra

Invariant Theory Mara D. Neusel, 2007 This book presents the characteristic zero invariant theory of finite groups acting linearly on polynomial algebras The author assumes basic knowledge of groups and rings and introduces more advanced methods from commutative algebra along the way The theory is illustrated by numerous examples and applications to physics engineering numerical analysis combinatorics coding theory and graph theory A wide selection of exercises and suggestions for further reading makes the book appropriate for an advanced undergraduate or first year graduate level course

**Reflection Groups and Invariant Theory** Richard Kane, 2001-06-21 Reflection groups and invariant theory is a branch of mathematics that lies at the intersection between geometry and algebra The book contains a

deep and elegant theory evolved from various graduate courses given by the author over the past 10 years

**Polynomial Invariants of Finite Groups** Larry Smith, 2019-12 Written by an algebraic topologist motivated by his own desire to learn this well written book represents the compilation of the most essential and interesting results and methods in the theory of polynomial invariants of finite groups From the table of contents Invariants and Relative Invariants Finite Generation of Invariants Construction of Invariants Poincaré Series Dimension Theoretic Properties of Rings of Invariants Homological Properties of Invariants Groups Generated by Reflections Modular Invariants Polynomial Tensor Exterior Algebras Invariant Theory and Algebraic Topology The Steenrod Algebra and Modular Invariant Theory *A Crash Course in Invariant Theory of Finite Groups* Larry Smith, 1998

*Polynomial Invariants of Finite Groups* D. J. Benson, 1993-10-07 This is the first book to deal with invariant theory and the representations of finite groups

**Modular Invariant Theory** H.E.A. Eddy Campbell, David Wehlau, 2011-04-08 This book covers the modular invariant theory of finite groups the case when the characteristic of the field divides the order of the group a theory that is more complicated than the study of the classical non modular case Largely self contained the book develops the theory from its origins up to modern results It explores many examples illustrating the theory and its contrast with the better understood non modular setting It details techniques for the computation of invariants for many modular representations of finite groups especially the case of the cyclic group of prime order It includes detailed examples of many topics as well as a quick survey of the elements of algebraic geometry and commutative algebra as they apply to invariant theory The book is aimed at both graduate students and researchers an introduction to many important topics in modern algebra within a concrete setting for the former an exploration of a fascinating subfield of algebraic geometry for the latter

Topics in Invariant Theory Marie-Paule Malliavin, 2006-11-14 These proceedings reflect the main activities of the Paris Séminaire d'Algèbre 1989-1990 with a series of papers in Invariant Theory Representation Theory and Combinatorics It contains original works from J Dixmier F Dumas D Krob P Pragacz and B J Schmid as well as a new presentation of Derived Categories by J E Björk and as introduction to the deformation theory of Lie equations by J F Pommaret J Dixmier Sur les invariants du groupe symétrique dans certaines représentations II B J Schmid Finite groups and invariant theory J E Björk Derived categories P Pragacz Algebro Geometric applications of Schur S and Q polynomials F Dumas Sous corps de fractions rationnelles des corps gauches de séries de Laurent D Krob Expressions rationnelles sur un anneau J F Pommaret Deformation theory of algebraic and Geometric structures M van den Bergh Differential operators on semi invariants for tori and weighted projective spaces

**Finite Groups and Invariant Theory** Barbara J. Schmid, 1990

**Modular Invariant Theory** H.E.A. Eddy Campbell, David L. Wehlau, 2011-01-12 This book covers the modular invariant theory of finite groups the case when the characteristic of the field divides the order of the group a theory that is more complicated than the study of the classical non modular case Largely self contained the book develops the theory from its origins up to modern results It explores many examples illustrating the theory and its contrast

with the better understood non modular setting It details techniques for the computation of invariants for many modular representations of finite groups especially the case of the cyclic group of prime order It includes detailed examples of many topics as well as a quick survey of the elements of algebraic geometry and commutative algebra as they apply to invariant theory The book is aimed at both graduate students and researchers an introduction to many important topics in modern algebra within a concrete setting for the former an exploration of a fascinating subfield of algebraic geometry for the latter

*Computational Invariant Theory* Harm Derksen, Gregor Kemper, 2013-04-17 Invariant theory is a subject with a long tradition and an astounding ability to rejuvenate itself whenever it reappears on the mathematical stage Throughout the history of invariant theory two features of it have always been at the center of attention computation and applications This book is about the computational aspects of invariant theory We present algorithms for calculating the invariant ring of a group that is linearly reductive or finite including the modular case These algorithms form the central pillars around which the book is built To prepare the ground for the algorithms we present Gröbner basis methods and some general theory of invariants Moreover the algorithms and their behavior depend heavily on structural properties of the invariant ring to be computed Large parts of the book are devoted to studying such properties Finally most of the applications of invariant theory depend on the ability to calculate invariant rings The last chapter of this book provides a sample of applications inside and outside of mathematics

**E. Noether's bound in the invariant theory of finite groups** Larry Smith, 1995

**Invariant Theory in All Characteristics** Harold Edward Alexander Eddy Campbell, David L. Wehlau, 2004 This volume includes the proceedings of a workshop on Invariant Theory held at Queen's University Ontario The workshop was part of the theme year held under the auspices of the Centre de recherches mathématiques CRM in Montreal The gathering brought together two communities of researchers those working in characteristic 0 and those working in positive characteristic The book contains three types of papers survey articles providing introductions to computational invariant theory modular invariant theory of finite groups and the invariant theory of Lie groups expository works recounting recent research in these three areas and beyond and open problems of current interest The book is suitable for graduate students and researchers working in invariant theory

*Invariant Theory* T.A. Springer, 2006-11-14

**Invariant Theory of Torus and Finite Groups** Santosh Kumar Pattanayak, 2011-09 Geometric invariant theory GIT provides a construction of quotients for projective algebraic varieties equipped with an action of a reductive algebraic group Since its foundation by Mumford GIT plays an important role in the construction of moduli or parameter spaces More recently its methods have been successfully applied to problems of representation theory Many algebraic as well as geometric properties have been studied over the last few decades One direction of our work is the study of projective normality of GIT quotient varieties for finite group actions and another direction is to study the semi stable points for a maximal torus action on the homogeneous space  $G/P$  Chapter 1 gives a brief account of the theory of algebraic groups Chapter 2 is a survey of computational invariant theory of finite

groups as well as reductive algebraic groups In this chapter we present many classical as well as modern results in invariant theory Chapter 3 is about torus action on  $G/P$  and In Chapter 4 we study the projective normality of GIT quotient varieties for the action of finite groups At the end of this chapter we describe some of the questions that remain to be answered

The Noether Bound in Invariant Theory of Finite Groups Peter Fleischmann, 1999      *Invariant Theory in All Characteristics* Harold Edward Alexander Eddy Campbell, David L. Wehlau, This volume includes the proceedings of a workshop on Invariant Theory held at Queen's University Ontario The workshop was part of the theme year held under the auspices of the Centre de recherches mathématiques CRM in Montreal The gathering brought together two communities of researchers those working in characteristic 0 and those working in positive characteristic The book contains three types of papers survey articles providing introductions to computational invariant theory modular invariant theory of finite groups and the invariant theory of Lie groups expository works recounting recent research in these three areas and beyond and open problems of current interest The book is suitable for graduate students and researchers working in invariant theory

E. Noether's Bound in the Invariant Theory of Finite Groups L. Smith, 1995      **Reflection Groups and Invariant Theory** Richard Kane, 2013-03-09

Reflection Groups and their invariant theory provide the main themes of this book and the first two parts focus on these topics The first 13 chapters deal with reflection groups Coxeter groups and Weyl groups in Euclidean Space while the next thirteen chapters study the invariant theory of pseudo reflection groups The third part of the book studies conjugacy classes of the elements in reflection and pseudo reflection groups The book has evolved from various graduate courses given by the author over the past 10 years It is intended to be a graduate text accessible to students with a basic background in algebra Richard Kane is a professor of mathematics at the University of Western Ontario His research interests are algebra and algebraic topology Professor Kane is a former President of the Canadian Mathematical Society

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