

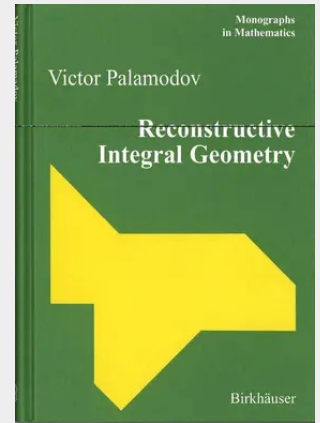
Reconstructive Integral Geometry

These lecture notes treat polynomial identity rings from both the combinatorial and structural points of view. The former studies the ideal of polynomial identities satisfied by a ring. The latter studies the properties of rings which satisfy a polynomial identity.

The greater part of recent research in polynomial identity rings is about combinatorial questions, and the combinatorial part of the lecture notes gives an up-to-date account of recent research. On the other hand, the main structural results have been known for some time, and the emphasis there is on a presentation accessible to newcomers to the subject.

The intended audience is graduate students in algebra, and researchers in algebra, combinatorics and invariant theory.

One hundred years ago (1904) Hermann Minkowski [58] posed a problem: to reconstruct an even function I on the sphere S^2 from knowledge of the integrals $M_I(C) = \int_C I$ over big circles C . Paul Funk found an explicit reconstruction formula for I from data of big circle integrals. Johann Radon studied a similar problem for the Euclidean plane and space. The interest in reconstruction problems like Minkowski Funk's and Radon's has grown tremendously in the last four decades, stimulated by the spectrum of new modalities of image reconstruction. These are X-ray, MRI, gamma and positron radiography, ultrasound, seismic tomography, electron microscopy, synthetic radar imaging and others. The physical principles of these methods are very different, however their mathematical models and solution methods have very much in common. The umbrella name reconstructive integral geometry is used to specify the variety of these problems and methods. The objective of this book is to present in a uniform way the scope of well known and recent results and methods in the reconstructive integral geometry. We do not touch here the problems arising in adaptation of analytic methods to numerical reconstruction algorithms. We refer to the books [61], [62] which are focused on these problems. Various aspects of interplay of integral geometry and differential equations are discussed in Chapters 7 and 8. The results presented here are partially new.



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