Analytic projective geometry

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] Projective geometry, like Euclidean ge
projective space of dimension n is now
; we then get not only points and lines b
definition in this book is somewhat diffe
which there is no concept of distance o
while Euclidean geometry can be inform
straightedge only constructions. Surpris
similar since it seems to deal primarily v
pair of railroad tracks converging on the
that point represent in the real world? P
preserved by this map, called the cross
geometry problems. We study the pole
and Brokard. Projective geometry is an
begins with the study of configurations
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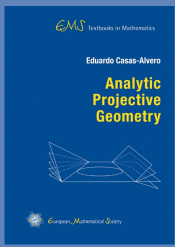

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Eduardo Casas-Alvero (Universitat de Barcelona, Spain)

Analytic Projective Geometry

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Projective geometry is concerned with the properties of figures that are invariant by projecting and taking sections. It is considered one of the most beautiful parts of geometry and plays a central role because its specializations cover the whole of the affine, Euclidean and non-Euclidean geometries. The natural extension of projective geometry is projective algebraic geometry, a rich and active field of research. Regarding its applications, results and techniques of projective geometry are today intensively used in computer vision.

This book contains a comprehensive presentation of projective geometry, over the real and complex number fields, and its applications to affine and Euclidean geometries. It covers central topics such as linear varieties, cross ratio, duality, projective transformations, quadrics and their classifications – projective, affine and metric –, as well as the more advanced and less usual spaces of quadrics, rational normal curves, line complexes and the classifications of collineations, pencils of quadrics and correlations. Two appendices are devoted to the projective foundations of perspective and to the projective models of plane non-Euclidean geometries. The presentation uses modern language, is based on linear algebra and provides complete proofs. Exercises are proposed at the end of each chapter; many of them are beautiful classical results.

The material in this book is suitable for courses on projective geometry for undergraduate students, with a working knowledge of a standard first course on linear algebra. The text is a valuable guide to graduate students and researchers working in areas using or related to projective geometry, such as algebraic geometry and computer vision, and to anyone wishing to gain an advanced view on geometry as a whole.

Keywords: Projective geometry, affine geometry, Euclidean geometry, linear varieties, cross ratio, projectivities, quadrics, pencils of quadrics, correlations

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