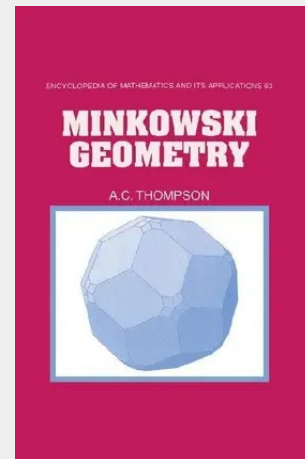


Minkowski Geometry

Minkowski geometry is a type of non-Euclidean geometry in a finite number of dimensions in which distance is not 'uniform' in all directions. This book presents the first comprehensive treatment of Minkowski geometry since the 1940s. The author begins by describing the fundamental metric properties and the topological properties of existence of Minkowski space. This is followed by a treatment of two-dimensional spaces and characterisations of Euclidean space among normed spaces. The central three chapters present the theory of area and volume in normed spaces, a fascinating geometrical interplay among the various roles of the ball in Euclidean space. Later chapters deal with trigonometry and differential geometry in Minkowski spaces. The book ends with a brief look at J. J. Schaffer's ideas on the intrinsic geometry of the unit sphere. Minkowski Geometry will appeal to students and researchers interested in geometry, convexity theory and functional analysis.

Minkowski geometry is a non-Euclidean geometry in a finite number of dimensions that is different from elliptic and hyperbolic geometry (and from the Minkowskian geometry of spacetime). Here the linear structure is the same as the Euclidean one but distance is not "uniform" in all directions. Instead of the usual sphere in Euclidean space, the unit ball is a general symmetric convex set. Therefore, although the parallel axiom is valid, Pythagoras' theorem is not. This book begins by presenting the topological properties of Minkowski spaces, including the existence and essential uniqueness of Haar measure, followed by the fundamental metric properties - the group of isometries, the existence of certain bases and the existence of the Lowner ellipsoid. This is followed by characterizations of Euclidean space among normed spaces and a full treatment of two-dimensional spaces. The three central chapters present the theory of area and volume in normed spaces. The author describes the fascinating geometric interplay among the isoperimetrix (the convex body which solves the isoperimetric problem), the unit ball and their duals, and the ways in which various roles of the ball in Euclidean space are divided among them. The next chapter deals with trigonometry in Minkowski spaces and the last one takes a brief look at a number of numerical parameters associated with a normed space, including J. J. Schaffer's ideas on the intrinsic geometry of the unit sphere. Each chapter ends with a section of historical notes and the book ends with a list of 50 unsolved problems. Minkowski Geometry will appeal to students and researchers interested in geometry, convexity theory and functional analysis.



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