

### **Geometry of Mobius Transformations: Elliptic, Parabolic and Hyperbolic Actions of SL2(R)**

Vladimir V. Kisil



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This book is a unique exposition of rich and inspiring geometries associated with Möbius transformations of the hypercomplex plane. The presentation is self-contained and based on the structural properties of the group  $SL_2(R)$ . Starting from elementary facts in group theory, the author unveils surprising new results about the geometry of circles, parabolas and hyperbolas, using an approach based on the Erlangen programme of F Klein, who defined geometry as a study of invariants under a transitive group action.

The treatment of elliptic, parabolic and hyperbolic Möbius transformations is provided in a uniform way. This is possible due to an appropriate usage of complex, dual and double numbers which represent all nonisomorphic commutative associative two-dimensional algebras with unit. The hypercomplex numbers are in perfect correspondence with the three types of geometries concerned. Furthermore, connections with the physics of Minkowski and Galilean space-time are considered.

Readership: Undergraduate and graduate students in geometry and algebra.

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