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Baker, Andrew **[Baker, Andrew J.]** (4-GLAS)

★**Matrix groups. (English summary)**

An introduction to Lie group theory.
Springer Undergraduate Mathematics Series.
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This excellent book gives an easy introduction to the theory of Lie groups and Lie algebras by restricting the material to real and complex matrix groups. This provides the reader not only with a wealth of examples, but it also makes the key concepts much more concrete. This combination makes the material in this book more easily accessible for readers with a limited background. A similar approach was followed by Curtis in his matrix group book, which is one of the classical texts in Lie theory. The current book expands the material in Curtis considerably by discussing most of the fundamental concepts in basic Lie theory as well as a much larger selection of matrix groups. The book is very easy to read and highly suitable for an elementary course in Lie theory aimed at advanced undergraduates or beginning graduate students.

The book consists of 12 chapters in which the following topics are discussed.

In the first chapter the author introduces some of the basic concepts needed to study matrix groups and introduces some of the standard matrix groups over the real and complex numbers, like the (special) linear group, orthogonal groups, symplectic groups, unitary groups, etc. Besides this the book also discusses isometry groups, affine transformation groups, stabilizer subgroups, etc.

Chapter 2 introduces one-parameter subgroups and the exponential map. The Lie algebra and the adjoint representation are introduced in Chapter 3. More examples of matrix groups are given in Chapters 4 and 5, where automorphism groups of finite-dimensional algebras are discussed. This includes a discussion of the quaternions and the real Clifford algebras and their related groups. Chapter 6 discusses another important class of examples, the Lorentz groups.

In Chapter 7 general Lie groups are introduced and some of the basic properties are discussed.

The next two chapters deal with homogeneous spaces, which includes a discussion of projective spaces and Grassmannians. In the remaining chapters the basic theory of compact connected Lie groups and their maximal tori are discussed. This includes a discussion of the conjugacy of maximal tori, root systems, Weyl groups and lots of examples.

To summarize, this is a well-written book, which is highly suited as an introductory text for beginning graduate students without much background in differental geometry or for advanced undergraduates. It is a welcome addition to the literature in Lie theory.

Reviewed by *Aloysius Helminck*