The membership problem in matrix semigroups

Given a finite set of matrices $G=\{M_1,M_2,...,M_k\}$ and a matrix M. Determine whether there exists a sequence of matrices $M_{i1},M_{i2},...,M_{il}$ from G such that $M_{i1}\times M_{i2}\times...\times M_{il}=M$



In other words, Let S be a given finitely generated semigroup of $n \times n$ matrices from $Z^{n \times n}(Q^{n \times n})$. Determine whether a matrix M belongs to S.



The motrality (membership for the zero matrix) is undecidable for 3x3 matrices. [M.Paterson]

Semigroups Of Matrices

Jan Okni?ski

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nothing seems to be left of the original portrait Miraculously structured images appear briefly as we continue to apply the distortion procedure to successive images After 241 iterations the original picture reappears unchanged Apparently the pixels of the Poincare portrait were moving about in accordance with a strictly deterministic rule More importantly the set of all pixels the whole portrait was transformed by the distortion mechanism In this exam ple the transformation seems to have been a reversible one since the original was faithfully recreated It is not very farfetched to introduce a certain amount of randomness and irreversibility in the above example Think of a random miscoloring of some pixels or of inadvertently giving a pixel the color of its neighbor The methods in this book are geared towards being applicable to the asymp totics of such transformation processes The transformations form a semigroup in a natural way we want to investigate the long term behavior of random elements of this semigroup **Lectures in Semigroups** Mario Petrich, 1977 **Theory of Semigroups, Volume I** Alfred Hoblitzelle Clifford, G. B. Preston, 1961-12-31 The material in this volume was presented in a second year graduate course at Tulane University during the academic year 1958 1959 The book aims at being largely self contained but it is assumed that the reader has some familiarity with sets mappings groups and lattices Only in Chapter 5 will more preliminary knowledge be required and even there the classical definitions and theorems on the matrix representations of algebras and groups are summarized **Mathematics across the Iron Curtain** Christopher Hollings, 2014-07-16 The theory of semigroups is a relatively young branch of mathematics with most of the major results having appeared after the Second World War This book describes the evolution of algebraic semigroup theory from its earliest origins to the establishment of a full fledged theory Semigroup theory might be termed Cold War mathematics because of the time during which it developed There were thriving schools on both sides of the Iron Curtain although the two sides were not always able to communicate with each other or even gain access to the other's publications A major theme of this book is the comparison of the approaches to the subject of mathematicians in East and West and the study of the extent to which contact between the two sides was possible Monoids And Semigroups With Applications - Proceedings Of The Berkeley Workshop In Monoids John Rhodes, 1991-03-06 The purpose of the Berkeley Workshop on Monoids was to give expository talks by the most qualified experts in the emerging main areas of monoid and semigroup theory including applications to theoretical computer science This was supplemented with current research papers The topics covered in an accessible way for the mathematical and theoretical computer community were Kernels and expansions in semigroup theory Implicit operations Inverse monoids Varieties of semigroups and universal algebra Linear semigroups and monoids of Lie type Monoids acting on tress Synthesis theorem regular semigroups and applications Type II conjecture Application to theoretical computer science and decision problems Semigroups, Algebras and Operator Theory P G Romeo, John. C Meakin, A R Rajan, 2015-07-06 This book discusses recent developments in semigroup theory and its applications in areas such as operator algebras operator approximations and category theory All contributing authors are eminent researchers in

their respective fields from across the world Their papers presented at the 2014 International Conference on Semigroups Algebras and Operator Theory in Cochin India focus on recent developments in semigroup theory and operator algebras They highlight current research activities on the structure theory of semigroups as well as the role of semigroup theoretic approaches to other areas such as rings and algebras The deliberations and discussions at the conference point to future research directions in these areas This book presents 16 unpublished high quality and peer reviewed research papers on areas such as structure theory of semigroups decidability vs undecidability of word problems regular von Neumann algebras operator theory and operator approximations Interested researchers will find several avenues for exploring the connections between semigroup theory and the theory of operator algebras

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