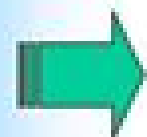
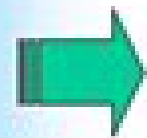


The membership problem in matrix semigroups

Given a finite set of matrices $G = \{M_1, M_2, \dots, M_k\}$ and a matrix M . Determine whether there exists a sequence of matrices $M_{i_1}, M_{i_2}, \dots, M_{i_l}$ from G such that $M_{i_1} \times M_{i_2} \times \dots \times M_{i_l} = M$



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

M Woodhall



Semigroups Of Matrices:

Semigroups Of Matrices Jan Okninski, 1998-07-31 This book is concerned with the structure of linear semigroups that is subsemigroups of the multiplicative semigroup $M_n(K)$ of $n \times n$ matrices over a field K or more generally skew linear semigroups if K is allowed to be a division ring and its applications to certain problems on associative algebras semigroups and linear representations It is motivated by several recent developments in the area of linear semigroups and their applications It summarizes the state of knowledge in this area presenting the results for the first time in a unified form The book's point of departure is a structure theorem which allows the use of powerful techniques of linear groups Certain aspects of a combinatorial nature connections with the theory of linear representations and applications to various problems on associative algebras are also discussed

Probability Measures on Semigroups Göran Högnäs, Arunava Mukherjee, 2010-11-02 This second edition presents up to date material on the theory of weak convergence of convolution products of probability measures in semigroups the theory of random walks on semigroups and their applications to products of random matrices In addition this unique work examines the essentials of abstract semigroup theory and its application to concrete semigroups of matrices This substantially revised text includes exercises at various levels at the end of each section and includes the best available proofs on the most important theorems used in a book making it suitable for a one semester course on semigroups In addition it could also be used as a main text or supplementary material for courses focusing on probability on algebraic structures or weak convergence This book is ideally suited to graduate students in mathematics and students in other fields such as engineering and the sciences with an interest in probability Students in statistics using advanced probability will also find this book useful

Semigroups of Matrices Lawrence John Huber, 1962 **The Algebraic Theory of Semigroups, Volume I** Alfred H. 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

On Semigroups of Matrices in the $(\max, +)$ Algebra Institut National de Recherche en Informatique et en Automatique, Stéphane Gaubert, 1994 **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 Lectures in Semigroups Mario Petrich,1977 **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 *Semigroups* E. S. Ljapin,1968 Handbook of Elasticity Solutions Mark L. Kachanov,B. Shafiro,Igor Tsukrov,2003-11-30 This Handbook is intended as a desk reference for researchers students and engineers working in various areas of solid mechanics and quantitative materials science It contains a broad range of elasticity solutions In particular it covers the following topics Basic equations in various coordinate systems Green s functions for isotropic and anisotropic solids Cracks in two and three dimensional solids Eshelby s problems and related results Stress concentrations at inhomogeneities Contact problems Thermoelasticity The solutions have been collected from a large number of monographs and research articles Some of the presented results were obtained only recently and are not easily available All solutions have been thoroughly checked and transformed to a userfriendly form Inequalities: Theory of Majorization and Its Applications Albert W. Marshall,Ingram Olkin,Barry C. Arnold,2010-11-25 This book s first edition has been widely cited by researchers in diverse fields The following are excerpts from reviews Inequalities Theory of Majorization and its Applications merits strong praise It is innovative coherent well written and most importantly a pleasure to read This work is a valuable resource Mathematical Reviews The authors present an extremely rich collection of inequalities in a remarkably

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Foundations of Computational Mathematics Felipe Cucker, Michael Shub, 2012-12-06 This book contains a collection of articles corresponding to some of the talks delivered at the Foundations of Computational Mathematics conference held at IMPA in Rio de Janeiro in January 1997 Some of the others are published in the December 1996 issue of the Journal of Complexity Both of these publications were available and distributed at the meeting Even in this aspect we hope to have achieved a synthesis of the mathematics and computer science cultures as well as of the disciplines The reaction to the Park City meeting on Mathematics of Numerical Analysis Real Number Algorithms which was chaired by Steve Smale and had around 275 participants was very enthusiastic At the suggestion of Narendra Karmarkar a lunch time meeting of Felipe Cucker Arieh Iserles Narendra Karmarkar Jim Renegar Mike Shub and Steve Smale decided to try to hold a periodic meeting entitled Foundations of Computational Mathematics and to form an organization with the same name whose primary purpose will be to hold the meeting This is then the first edition of FoCM as such It has been organized around a small collection of workshops namely Systems of algebraic equations and computational algebraic geometry Homotopy methods and real machines Information based complexity Numerical linear algebra Approximation and PDEs Optimization Differential equations and dynamical systems Relations to computer science Vision and related computational tools There were also twelve plenary speakers Inverse Semigroups, The Theory Of Partial Symmetries Mark V Lawson, 1998-11-06 Symmetry is one of the most important organising principles in the natural sciences The mathematical theory of symmetry has long been

associated with group theory but it is a basic premise of this book that there are aspects of symmetry which are more faithfully represented by a generalization of groups called inverse semigroups The theory of inverse semigroups is described from its origins in the foundations of differential geometry through to its most recent applications in combinatorial group theory and the theory tilings

Semigroups and Formal Languages Jorge M. Andre, 2007 This festschrift volume in honour of Donald B McAlister on the occasion of his 65th birthday presents papers from leading researchers in semigroups and formal languages The contributors cover a number of areas of current interest from pseudovarieties and regular languages to ordered groupoids and one relator groups and from semigroup algebras to presentations of monoids and transformation semigroups The papers are accessible to graduate students as well as researchers seeking new directions for future work

MOD Natural Neutrosophic Subset Semigroups W. B. Vasantha Kandasamy , Ilanthenral K, Florentin Smarandache, 2016 In this book the authors introduce for the first time the MOD Natural Subset Semigroups They enjoy very many special properties They are only semigroups even under addition This book provides several open problems to the semigroup theorists

Proceedings of the Seventh Annual ACM-SIAM Symposium on Discrete Algorithms, 1996-01-01 This text covers the proceedings of the Seventh Annual ACM SIAM Symposium on Discrete Algorithms which was held in Atlanta Georgia in January 1996

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