

MAXIMAL SUBGROUPS OF THE MULTIPLICATIVE SEMIGROUP OF 2×2 SUPERTROPICAL MATRICES

MEENAKSHI* AND POOJA DEVI

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We give a complete characterisation of Green's relations $\mathcal{L}$, $\mathcal{R}$, $\mathcal{H}$, $\mathcal{D}$ and $\mathcal{J}$ in the multiplicative semigroup of 2×2 supertropical matrices. We determine the maximal subgroups of the semigroup $M_2(\mathbb{T})$ by finding the $\mathcal{R}$ -classes containing idempotents, followed by the identification of $\mathcal{H}$ -classes.

1. Introduction

Supertropical algebra has developed in recent years as an extension of the classical tropical algebra, providing a broader and more flexible framework for studying idempotent semirings and their geometric applications. Due to the idempotent nature of addition and the absence of additive inverses, classical notions such as the method of finding the roots of a polynomial, linear dependence of vectors, matrix rank, and a systematic development of matrix theory over the tropical algebra may fail. Izhakian in [1] introduced a generalized algebraic structure known as the supertropical algebra with the modified operations, due to which many classical ideas in the matrix theory, the theory of polynomials, and the geometric notions over supertropical algebra arise naturally. The regularity, invertibility, the concept of linear dependence of vectors in a supertropical vector space, the rank of matrices and supertropical linear algebra are examined in [1, 2, 3, 4, 5]. The theory of polynomials and their roots over supertropical semifields is given in [6, 7, 8, 9]. The supertropical geometry is discussed by Zur Izhakian in [1, 6, 10].

*Corresponding Author

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