

LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN





Prof. Dr. Fabien Morel Dr. Andrei Lavrenov, Oliver Hendrichs

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Lineare Algebra I – Tutoriumsblatt07

Aufgabe 1.

There is a table 2×3 with zeros at all positions. It is allowed to choose a table cell and to change 0's to 1's and 1's to 0's in the chosen cell and all its neighbours. How many configurations one can obtain by a sequence of such operations?

Aufgabe 2.

Are the vectors $v_1 = (4, -5, 2, 6), v_2 = (2, -2, 1, 3), v_3 = (6, -3, 3, 9), v_4 = (4, -1, 5, 6)$ of \mathbb{R}^4 linearly independent?

Aufgabe 3.

Let $u_i \in \mathbb{Z}^n$, $1 \leq i \leq k$, and assume that their images \overline{u}_i in $(\mathbb{Z}/p\mathbb{Z})^n$ are linearly independent for some prime p. Prove that u_i are also linearly independent considered as elements of \mathbb{Q}^n .

Aufgabe 4.

Let U, V be vector spaces over a field K, such that $\dim U = \dim V = n$ and $f: U \to V$ a linear map. Prove that f is injective if and only if f is surjective.