



Prof. Dr. Fabien Morel

Dr. Andrei Lavrenov, Oliver Hendrichs

Wintersemester 2024/25

24. Januar 2025

Lineare Algebra I – Tutoriumsblatt 13

Aufgabe 1.

1. Find the roots of the polynomial $x^2 - 2x + 2$ a) over $\mathbb{C}$; b) over $\mathbb{Z}/5\mathbb{Z}$.
2. Find the roots of the polynomial $x^3 + x^2 - 9x + 6$ over $\mathbb{C}$.
3. Decompose $x^4 + 4$ as a product of indecomposable polynomials over $\mathbb{R}$.

Aufgabe 2.

Find the eigenvalues and the eigenvectors of the matrix

$$\begin{pmatrix} 5 & 6 & -3 \\ -1 & 0 & 1 \\ 1 & 2 & -1 \end{pmatrix}.$$

Aufgabe 3.

Which of the following matrices are diagonalizable over $\mathbb{C}$?

$$\begin{pmatrix} 2 & -2 \\ 2 & -2 \end{pmatrix}, \begin{pmatrix} 2 & 0 \\ -2 & -2 \end{pmatrix}, \begin{pmatrix} 2 & 0 \\ 2 & 2 \end{pmatrix}.$$

Aufgabe 4.

Let $v_0 \in \mathbb{R}^2$. Consider the recursively defined sequence of vectors $(v_n)_{n \in \mathbb{N}}$ where

$$v_{n+1} = Av_n,$$

for $A = \begin{pmatrix} 11 & -14 \\ 7 & -10 \end{pmatrix}$. Determine all v_0 , for which there exists $N \in \mathbb{N}$, such that for all $n \geq N$ the first coordinate of v_n is greater than zero.