

Differential Equations I for Students of Engineering Sciences

Sheet 1, Homework

Exercise 1: (Repetition of mathematics II, if necessary please revise!)

Determine all eigenvalues, eigenvectors and if appropriate generalized eigenvectors of the matrix

$$A = \begin{pmatrix} 5 & 1 & 0 & 0 \\ 0 & 5 & 0 & 1 \\ 0 & 0 & -1 & 1 \\ 0 & 0 & 0 & -3 \end{pmatrix}.$$

Exercise 2: (Repetition of mathematics II, if necessary please revise!)

Please use Laplace expansion along rows or columns. Do not work solely with the rule of Sarrus!

- a) Let A be a real $n \times n$ matrix $\lambda = a + ib$ with $a, b \in \mathbb{R}$ an eigenvalue of A with corresponding eigenvector \mathbf{v} and i the imaginary unit with $i^2 = -1$. Show that $\bar{\lambda} = a - ib$ is an eigenvalue of A with corresponding eigenvector $\bar{\mathbf{v}}$.
- b) Determine all eigenvalues and eigenvectors of the matrix

$$B = \begin{pmatrix} 2 & 0 & 3 \\ 2 & 1 & 2 \\ -3 & 0 & 2 \end{pmatrix}.$$

Date: 16.10.-17.10.2023