Linear Algebra

Prof. Gerhard Jäger, winter term 2023/2024

Assignment 11

1. (2 points) Find an orthogonal matrix Q that diagonalizes $S = \begin{pmatrix} -2 & 6 \\ 6 & 7 \end{pmatrix}$. What is Λ?
2. (4 points) Find **all** orthogonal matrices that diagonalize $S = \begin{pmatrix} 9 & 12 \\ 12 & 16 \end{pmatrix}$.
3. (2 points) Consider the matrix

$$A = \begin{pmatrix} 2 & 0 & 0 \\ -6 & 4 & 4 \\ 3 & -1 & 0 \end{pmatrix}$$

   (a) Determine all eigenvalues and their algebraic multiplicity.

   (b) Find a maximal set of linearly independent eigenvectors.

4. (2 points) Consider $A = \begin{pmatrix} 2 & 0 \\ -1 & 2 \end{pmatrix}$. Perform Jordan decomposition, i.e., find an invertible matrix P and a matrix in Jordan Normal Form J such that $A = PJP^{-1}$.