LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN
MATHEMATISCHES INSTITUT

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Lineare Algebra II – Tutoriumsblatt 10

Aufgabe 1.
Find the Jordan Normal Form of the following matrix:

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

Aufgabe 2.

1. Find the angle between the vectors $u = (2, 1, 3, 2)$ and $v = (1, 2, -2, 1)$.
2. Find the cosines of the angles in the triangle ABC, where $A = (1, 2, 1, 2)$, $B = (3, 1, -1, 0)$, $C = (1, 1, 0, 1)$.

Aufgabe 3.

1. Norm the vector $(3, 1, 2, 1)$.
2. Find a vector v completing $u = (3/5, 4/5)$ to a orthonormal basis of the Eucledean space $\mathbb{R}^2$.

Aufgabe 4.
Let U be a subspace of a Eucledean space $\mathbb{R}^n$, $v \in \mathbb{R}^n$, and $u \in U$ the orthogonal projection of v onto U. Prove that the angle between u and v is the minimal among all angles between vectors $u' \in U$ and v.