Test 2 - Schlüsselthemen

Aufgabe 1 (Recap Basics)

1) A 7×5 matrix has $\boxed{\quad}$ rows.

2) Let $A \in \mathbb{R}^{2\times 4}$, then $A \cdot B$ is defined, if B is a $\boxed{\quad}$ $\times 4$ matrix.

3) Let A be a $n \times n$ matrix. A is invertible, iff $rankA = n - \boxed{\quad}$.

4) Let $A = \begin{pmatrix} 1 & 2 & 2 \\ 1 & 2 & 3 \\ 2 & 4 & 4 \end{pmatrix}$. A has $\boxed{\quad}$ free variable(s) and $\boxed{\quad}$ pivot(s).

5) For any A and x, the homogeneous linear systems of equations ($Ax = 0$) always has at least $\boxed{\quad}$ solution(s).

6) Let $x = \begin{pmatrix} 2 & 4 & 6 & 8 \end{pmatrix}^T \in \mathbb{R}^4$. Then $\min_{i\in\{1,\ldots,4\}} ||x \cdot e_i|| = \boxed{\quad}$ and $\arg\min_{i\in\{1,\ldots,4\}} ||x \cdot e_i|| = \boxed{\quad}$.

7) Let $A = CR$ where C contains the r linearly independent columns of A. We know that R has 2 rows, then $r = \boxed{\quad}$.

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Aufgabe 2 (Schlüssel)

1) Let $u, v, w \in \mathbb{R}^2$ and u, v be orthonormal. Then $dim(span\{u, v, w\}) = \boxed{\quad}$.

2) Let $V = \mathbb{R}^{3\times 2}$ be a vector space. A basis of V has exactly $\boxed{\quad}$ vectors.

3) Given a spanning set S of a subspace U of $\mathbb{R}^{10}$. We know $|S| = 4$, then $dimU \leq \boxed{\quad}$ and $dimU \geq \boxed{\quad}$.

4) Given a set M of vectors in a vector space V with $dimV = 2$. We know $\exists x \in M$ with $span(M - \{x\}) = V$. M has at least $\boxed{\quad}$ vector(s).

5) Given any basis. For all vectors there exists $\boxed{}$ linear combination(s) from the basis vectors.

6) Let $U \subseteq \mathbb{R}^3$. U is a subspace of $\mathbb{R}^3$, if $U = \{\begin{pmatrix} a & b & c \end{pmatrix}^T \in \mathbb{R}^3 \,|\, a+b+c = \boxed{}\}$.

7) Let $F : \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation and A the transformation matrix. A has $\boxed{}$ rows und $\boxed{}$ columns.

8) Given $Ax = b$, $\text{ref}(A) = \begin{pmatrix} 2 & -5 & 0 & 1 & 0 \\ 0 & 0 & 1 & 5 & 1 \end{pmatrix}$. Then we know any b has $\boxed{}$ dimension(s) of solutions x.

9) Given $Ax = b$, $\text{ref}(A) = \begin{pmatrix} 1 & 0 & -2 \\ 0 & 2 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$. Then any basis of $C(A)$ has $\boxed{}$ vector(s) and any basis of $N(A)$ has $\boxed{}$ vector(s).

10) Let $F : \mathbb{R}^5 \to \mathbb{R}^6$ be a linear transformation and A the transformation matrix with $dimC(A) = 3$. Then $dimN(A) = \boxed{}$

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