

## [HTML]2E7D32 Matrix Representation eines Linear Operators

Suppose  $T \in \mathcal{L}(V)$ . The matrix of  $T$  with respect to a basis  $v_1, \dots, v_n$  of  $V$  is the  $n \times n$  matrix

$$\mathcal{M}(T) = \begin{pmatrix} A_{1,1} & \dots & A_{1,n} \\ \vdots & & \vdots \\ A_{n,1} & \dots & A_{n,n} \end{pmatrix}$$

whose entries  $A_{j,k}$  are defined by:  $Tv_k = A_{1,k}v_1 + A_{2,k}v_2 + \dots + A_{n,k}v_n$

The  $k^{\text{th}}$  column of the matrix  $\mathcal{M}(T)$  is formed from the coefficients used to write  $Tv_k$  as a linear combination of the basis  $v_1, \dots, v_n$

Examples:  $T \in \mathcal{L}(\mathbb{F}^3)$  by  $T(x, y, z) = (2x + y, 5y + 3z, 8z)$ , then  $\mathcal{M}(T)$  with respect to the standard basis of  $\mathbb{F}^3$  is

$$\mathcal{M}(T) = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 5 & 3 \\ 0 & 0 & 8 \end{pmatrix}$$

## Recommended Reading

- **Lineare Algebra 1** by Menny-Akka (Match: 0.70)
- **Prüfungstraining Lineare Algebra : Band I** by Thomas C. T. Michaels (Match: 0.70)
- **Tutorium Analysis 1 und Lineare Algebra 1** by Florian Modler, Martin Kreh (Match: 0.69)