

# LINAG Ü10

4.2.7 b)  $f: \mathbb{R}^{4 \times 1} \rightarrow \mathbb{R} \quad \{e_1, e_2, e_3, e_4\} \dots \text{kanonische Basis des } \mathbb{R}^{4 \times 1}$   
 $\begin{pmatrix} a \\ b \\ c \\ d \end{pmatrix} \mapsto a \cdot p_1 + b \cdot p_2 + c \cdot p_3 + d \cdot p_4$

$$f\left(\begin{pmatrix} 3 \\ 3 \\ 4 \\ 2 \end{pmatrix}\right) = 52,2 \quad f\left(\begin{pmatrix} 3 \\ 1 \\ 2 \\ 2 \end{pmatrix}\right) = 33,8 \quad f\left(\begin{pmatrix} 2 \\ 1 \\ 1 \\ 2 \end{pmatrix}\right) = 24,8$$

$$f\left(\begin{pmatrix} 5 \\ 5 \\ 8 \\ 2 \end{pmatrix}\right) = 88,6$$

$$\begin{pmatrix} 3 & 3 & 2 & 5 \\ 3 & 1 & 1 & 5 \\ 4 & 2 & 1 & 8 \\ 2 & 2 & 2 & 2 \\ 52,2 & 33,8 & 24,8 & 88,6 \end{pmatrix} \xrightarrow{\substack{-\text{II} \quad -\text{III} \quad -\text{IV}}} \begin{pmatrix} 0 & 1 & 2 & 2 \\ 2 & 0 & 1 & 4 \\ 2 & 1 & 1 & 6 \\ 0 & 0 & 2 & 0 \\ 18,4 & 9 & 24,8 & 54,8 \end{pmatrix} \xrightarrow{\substack{\cdot (2^{-1}) \quad -2 \cdot \text{I}}} \begin{pmatrix} 0 & 1 & 2 & 2 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 2 \\ 0 & 0 & 2 & 0 \\ 9,2 & 9 & 24,8 & 18 \end{pmatrix}$$

$$\xrightarrow{\substack{-\text{I} \quad -2 \cdot \text{II}}} \begin{pmatrix} 0 & 1 & 2 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 9,2 & 9 & 15,6 & 0 \end{pmatrix} \xrightarrow{\substack{\cdot (2^{-1})}} \begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 9,2 & 9 & 7,8 & 0 \end{pmatrix}$$

$$f_1(e_1) = 0 \quad f_1(e_2) = 0,2 \quad f_1(e_3) = 9 \quad f_1(e_4) = 7,8$$

$$f_2(e_1) = 9 \quad f_2(e_2) = 9,2 \quad f_2(e_3) = 0 \quad f_2(e_4) = -1,2$$

$$\begin{aligned} f(e_1) - f(e_2) &= f(e_1 - e_2) = f\left(\begin{pmatrix} 1 \\ -1 \\ 0 \\ 0 \end{pmatrix}\right) = f\left(\begin{pmatrix} 1 \\ 0 \\ 1 \\ 0 \end{pmatrix} - \begin{pmatrix} 0 \\ 1 \\ 1 \\ 0 \end{pmatrix}\right) = \\ &= f\left(\begin{pmatrix} 1 \\ 0 \\ 1 \\ 0 \end{pmatrix}\right) - f\left(\begin{pmatrix} 0 \\ 1 \\ 1 \\ 0 \end{pmatrix}\right) = 9 - 7,8 = 1,2 \end{aligned}$$