

P12

$$a) \vec{v} = \vec{AB} = \begin{pmatrix} -1 \\ 3 \\ 0 \end{pmatrix} - \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix} \quad \vec{u} = \vec{AC} = \begin{pmatrix} 0 \\ 1 \\ -2 \end{pmatrix} - \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ -3 \end{pmatrix}$$

$$E_1: \vec{x} = \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix} + t \begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix} + s \begin{pmatrix} 1 \\ 0 \\ -3 \end{pmatrix}$$

$$b) g_1: \vec{x} = \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} + r \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix}$$

$$P_1 P_2 = \begin{pmatrix} 0 \\ -2 \\ 2 \end{pmatrix} - \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} = \begin{pmatrix} -1 \\ -2 \\ 4 \end{pmatrix}$$

$$-1 = 1s \Rightarrow s = -1$$

$$-2 = 2t \Rightarrow t = -1$$

$$\text{Probe: } 4 = -1(-1) + (-1)(-3)$$

$$c) \vec{w} = \vec{P_1 P_3} = \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix} - \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} = \begin{pmatrix} 0 \\ -2 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ -2 \\ 4 \end{pmatrix} = t \begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix} + s \begin{pmatrix} 1 \\ 0 \\ -3 \end{pmatrix}$$

$$0 = 1s \quad s = 0$$

$$-2 = 2t \quad t = -1$$

$$\text{Probe: } 4 \neq -1(-1) + 0(-3)$$

$$\Rightarrow g_1 \notin E_1$$

P13

$$a) \lambda_1 \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} + \lambda_2 \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} + \lambda_3 \begin{pmatrix} 3 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \Rightarrow \begin{matrix} \lambda_3 = 0 \\ \lambda_2 = 0 \\ \lambda_1 = 0 \end{matrix} \quad \text{l.u.}$$

b) l.u. 4 Vektoren im  $\mathbb{R}^3$

$$c) 5 \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} + 4 \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 4 \\ 5 \\ 0 \end{pmatrix} \quad \text{l.a.} \quad \checkmark_{1,2,3}$$

$$d) \lambda_1 \begin{pmatrix} 4 \\ 5 \\ 0 \end{pmatrix} + \lambda_2 \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \Rightarrow \begin{matrix} \lambda_1 = 0 \\ \lambda_2 = 0 \end{matrix} \quad \checkmark_{4,5,3}$$

$$e) \lambda_1 \begin{pmatrix} 4 \\ 5 \\ 0 \end{pmatrix} + \lambda_2 \begin{pmatrix} 3 \\ 0 \\ 0 \end{pmatrix} + \lambda_3 \begin{pmatrix} 0 \\ 2 \\ \lambda \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \quad \lambda \neq 0$$

Q15

$$x^2 + 2x + 1 = ax^2 + b(x-1) + c(x+1)$$

$$1x^2 + 2x + 1 = ax^2 + (b+c)x + (-b+c)$$

$$1 = a$$

$$b+c = 2$$

$$b = \frac{1}{2}$$

$$BP = \left(1, \frac{1}{2}, \frac{3}{2}\right)$$

$$-b+c = 1$$

$$c = \frac{3}{2}$$

$$x^2 + 2x + 1 = a + bx + cx^2$$

$$CP = (1, c, 1)$$

$$P14. q_k(x) = \prod_{\substack{j=1, \dots, n \\ j \neq k}} \frac{x-x_j}{x_k-x_j}$$

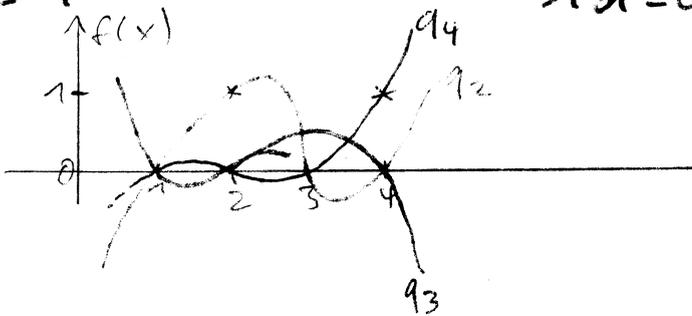
$$a) aq_1(x) + bq_2(x) + cq_3(x) + dq_4(x) = 0$$

$$x=1: a \cdot 1 + 0b + 0c + 0d = 0 \Rightarrow a=0$$

$$x=2: 0a + 1b + 0c + 0d = 0 \Rightarrow b=0$$

$$x=3: 0a + 0b + 1c + 0d = 0 \Rightarrow c=0$$

$$x=4: 0a + 0b + 0c + 1d = 0 \Rightarrow d=0$$



$$b) p(x) = a + bx + cx^2 + dx^3$$

$$a + b + c + d = -1$$

$$a + 2b + 4c + 8d = 0$$

$$a + 3b + 9c + 27d = 2$$

$$a + 4b + 16c + 64d = 1$$

$$c) p(x) = -1q_1(x) + 2q_3(x) + q_4(x)$$

$$p(x) = aq_1(x) + bq_2(x) + cq_3(x) + dq_4(x)$$

$$x=1: a \cdot 1$$

$$\stackrel{!}{=} -1$$