

6.3.12

$$U = [(1, -1, 1, -1), (1, 2, 3, 4)]$$

Bestäm en ON-bas för U^\perp .Skriv U^\perp som lösningsrum.

$$\left\{ \begin{array}{l} \begin{pmatrix} 1 \\ -1 \\ 1 \\ -1 \end{pmatrix} \cdot \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = 0 \\ \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix} \cdot \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = 0 \end{array} \right. \Leftrightarrow \begin{cases} x_1 - x_2 + x_3 - x_4 = 0 \\ x_1 + 2x_2 + 3x_3 + 4x_4 = 0 \end{cases}$$

$$\begin{array}{l} (-1) \\ \downarrow \end{array} \left(\begin{array}{cccc|c} 1 & -1 & 1 & -1 & 0 \\ 1 & 2 & 3 & 4 & 0 \end{array} \right) \Leftrightarrow \left(\begin{array}{cccc|c} 1 & -1 & 1 & -1 & 0 \\ 0 & 3 & 2 & 5 & 0 \end{array} \right)$$

$$\begin{cases} x_1 = -5s - 2t \\ x_2 = -2s - 5t \\ x_3 = 3s \\ x_4 = 3t \end{cases} \quad \text{bas } \bar{u}_1 = \begin{pmatrix} -5 \\ -2 \\ 3 \\ 0 \end{pmatrix}, \bar{u}_2 = \begin{pmatrix} -2 \\ -5 \\ 0 \\ 3 \end{pmatrix}$$

for U^\perp

$$\bar{f}_1 = \frac{1}{|\bar{u}_1|} \bar{u}_1 = \frac{1}{\sqrt{38}} \begin{pmatrix} -5 \\ -2 \\ 3 \\ 0 \end{pmatrix}$$



$$\bar{v}_2 = \bar{u}_2 - (\bar{u}_2 \cdot \bar{f}_1) \bar{f}_1 = \dots = \frac{3}{38} \begin{pmatrix} 9 \\ -50 \\ -20 \\ 38 \end{pmatrix}$$

$$\bar{f}_2 = \frac{1}{|\bar{v}_2|} \bar{v}_2 = \frac{1}{\sqrt{38}} \begin{pmatrix} 9 \\ -50 \\ -20 \\ 38 \end{pmatrix} \cdot \frac{3}{38} \quad U^\perp = \{\bar{f}_1, \bar{f}_2\}$$