

$$\begin{array}{c} \cdot 2 \\ \downarrow \\ \left| \begin{array}{cccc} 2 & -4 & -2 & 1 \\ -1 & 2 & 2 & 3 \\ 4 & -1 & 3 & 2 \\ 2 & 3 & -1 & -4 \end{array} \right| = \frac{1}{2} \left| \begin{array}{cccc} 4 & -4 & -2 & 1 \\ -2 & 2 & 2 & 3 \\ 8 & -1 & 3 & 2 \\ 4 & 3 & -1 & -4 \end{array} \right| \end{array}$$

$$\frac{1}{2} \left| \begin{array}{cccc} 4 & 0 & -2 & 1 \\ -2 & 0 & 2 & 3 \\ 8 & 7 & 3 & 2 \\ 4 & 7 & -1 & -4 \end{array} \right| \ominus = \frac{1}{2} \left| \begin{array}{cccc} -4 & 0 & -2 & 1 \\ -2 & 0 & 2 & 3 \\ 8 & 7 & 3 & 2 \\ 4 & 0 & 4 & 6 \end{array} \right|$$

$$\frac{1}{2} \cdot 2 \left| \begin{array}{cccc} -2 & 0 & -2 & 1 \\ -1 & 0 & 2 & 3 \\ 4 & 7 & 3 & 2 \\ 2 & 0 & 4 & 6 \end{array} \right| = \frac{1}{2} \cdot 2 \cdot 2 \cdot 7 \left| \begin{array}{cccc} -2 & 0 & -2 & 1 \\ -1 & 0 & 7 & 3 \\ 4 & 7 & 3 & 2 \\ 1 & 0 & 2 & 3 \end{array} \right|$$

$$\begin{array}{l} -14 \cdot (-20 + 4) \\ -14 \cdot (+16) = 224 \end{array} \quad \begin{array}{l} 14 \cdot (-1)^5 \cdot 1 \\ \left| \begin{array}{ccc} -2 & -2 & 1 \\ -1 & 2 & 3 \\ 1 & 2 & 3 \end{array} \right| \Rightarrow \begin{array}{l} -12 - 6 - 2 \\ \ominus \\ 2 + 6 - 12 \end{array} \end{array}$$

$$A \cdot \vec{x} = \vec{b}$$

$$\det(A) = -22$$

$$\begin{pmatrix} 1 & 3 & -2 \\ 2 & 1 & 0 \\ -4 & 1 & 2 \end{pmatrix} \cdot \vec{x} = \begin{pmatrix} 0 \\ 3 \\ 1 \end{pmatrix}$$

$$\begin{vmatrix} 1 & 0 \\ 1 & 2 \end{vmatrix} = 2$$

$$\begin{vmatrix} 2 & 0 \\ -4 & 2 \end{vmatrix} = -4$$

$$\begin{vmatrix} 2 & 1 \\ -4 & 1 \end{vmatrix} = 6$$

$$\begin{vmatrix} 3 & -2 \\ 1 & 2 \end{vmatrix} = -8$$

$$\begin{vmatrix} 1 & -2 \\ -4 & 2 \end{vmatrix} = -6$$

$$\begin{vmatrix} 1 & 3 \\ -4 & 1 \end{vmatrix} = 7$$

$$\begin{vmatrix} 3 & -2 \\ 1 & 0 \end{vmatrix} = 2$$

$$\begin{vmatrix} 1 & -2 \\ 2 & 0 \end{vmatrix} = -4$$

$$\begin{vmatrix} 1 & 3 \\ 2 & 1 \end{vmatrix} = -5$$

$$A^{-1} = -\frac{1}{22} \cdot \begin{pmatrix} 2 & -4 & 6 \\ -8 & -6 & -13 \\ 2 & -4 & -5 \end{pmatrix}^T$$

$$A^{-1} = \frac{1}{22} \begin{pmatrix} -2 & 8 & -2 \\ 4 & 6 & 4 \\ -6 & 13 & 5 \end{pmatrix}$$

$$\vec{x} = \frac{1}{22} \cdot \begin{pmatrix} -2 & 8 & -2 \\ 4 & 6 & 4 \\ -6 & 13 & 5 \end{pmatrix} \cdot \begin{pmatrix} 0 \\ 3 \\ 1 \end{pmatrix}$$

$$\vec{x} = \frac{1}{22} \begin{pmatrix} 0 + 24 - 2 \\ 0 + 18 + 4 \\ 0 + 39 + 5 \end{pmatrix} = \frac{1}{22} \cdot \begin{pmatrix} 22 \\ 22 \\ 44 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}$$

$$A = \begin{pmatrix} 1 & 3 & 3 \\ 2 & -2 & 1 \\ 1 & 3 & 2 \end{pmatrix} \Rightarrow \det(A) = \begin{matrix} -4 + 3 + 18 \\ \ominus \\ -6 + 12 + 3 \end{matrix} = \frac{17}{9} = 8$$

$\Rightarrow A$ ist regulär und A^{-1} existiert

$$\begin{vmatrix} -2 & 1 \\ 3 & 2 \end{vmatrix} = -7 \quad \begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix} = -3 \quad \begin{vmatrix} 2 & -2 \\ 1 & 3 \end{vmatrix} = 8$$

$$\begin{vmatrix} 3 & 3 \\ 3 & 2 \end{vmatrix} = +3 \quad \begin{vmatrix} 1 & 3 \\ 1 & 2 \end{vmatrix} = -1 \quad \begin{vmatrix} 1 & 3 \\ 1 & 3 \end{vmatrix} = 0$$

$$\begin{vmatrix} 3 & 3 \\ -2 & 1 \end{vmatrix} = 9 \quad \begin{vmatrix} 1 & 3 \\ 2 & 1 \end{vmatrix} = +5 \quad \begin{vmatrix} 1 & 3 \\ 2 & -2 \end{vmatrix} = -8$$

$$A^{-1} = \frac{1}{8} \cdot \begin{pmatrix} -7 & -3 & 8 \\ 3 & -1 & 0 \\ 9 & 5 & -8 \end{pmatrix}^T = \frac{1}{8} \begin{pmatrix} -7 & 3 & 9 \\ -3 & -1 & 5 \\ 8 & 0 & -8 \end{pmatrix}$$

$$\vec{x} = \frac{1}{18} \cdot \begin{pmatrix} -7 & 3 & 9 \\ -3 & -1 & 5 \\ 8 & 0 & -8 \end{pmatrix} \cdot \begin{pmatrix} 24 \\ -16 \\ 32 \end{pmatrix}$$

$$\begin{pmatrix} -7 & 3 & 9 \\ -3 & -1 & 5 \\ 8 & 0 & -8 \end{pmatrix} \cdot \begin{pmatrix} 3 \\ -2 \\ 4 \end{pmatrix} = \begin{pmatrix} -21 - 6 + 36 \\ -9 + 2 + 20 \\ 24 + 0 - 32 \end{pmatrix} = \begin{pmatrix} 9 \\ 13 \\ -8 \end{pmatrix}$$