Philip Laskowicz | Matr.Nr. 35569183 | philip.laskowicz@student.uni-kassel.de

Sonntag, 5. Februar 2023 16:28

A1 a) $A = \begin{pmatrix} 8 & -5 & 2 \\ 2 & 4 & -1 \\ 0 & -3 & 4 \end{pmatrix}$

$|a_{11}| = |8| = 8$

$\sum_{\nu=1}^{3} |a_{1\nu}| = |-5| + |2| = 7$

$\Rightarrow 8 > 7$ ✓

$|a_{22}| = |4| = 4$

$\sum_{\substack{\nu=1 \\ \nu \neq 2}}^{3} |a_{2\nu}| = |2| + |-1| = 3$

$\Rightarrow 4 > 3$ ✓

$|a_{33}| = |4| = 4$

$\sum_{\substack{\nu=1 \\ \nu \neq 3}}^{3} |a_{3\nu}| = |0| + |-3| = 3$

$\Rightarrow 4 > 3$ ✓

$\Rightarrow$ starkes ZSK ist erfüllt.

5) $A = \begin{pmatrix} 8 & -5 & 0 \\ 2 & 4 & -2 \\ 0 & -4 & 4 \end{pmatrix}$

$|a_{11}| = \ldots = 8$

$\sum_{\substack{\nu=1 \\ \nu \neq 1}}^{3} |a_{1\nu}| = \ldots = 5$

$\rightsquigarrow 8 > 5$ ✓

$|a_{22}| = \ldots = 4$

$\sum_{\substack{\nu=1 \\ \nu \neq 2}}^{3} |a_{2\nu}| = \ldots = 4$

$\rightsquigarrow 4 \not> 4$ aber $4 \geq 4$

$|a_{33}| = \ldots = 4$

$\sum_{\substack{\nu=1 \\ \nu \neq 3}}^{3} |a_{3\nu}| = \ldots = 4$

$\rightsquigarrow 4 \not> 4$ aber $4 \geq 4$

$\Rightarrow$ Da für $|a_{11}| > \sum_{\substack{\nu=1 \\ \nu \neq 1}}^{3} |a_{1\nu}|$ ist demnach

schwaches ZSK erfüllt

42)

$$12x_1 + 4x_2 = 64$$
$$-5x_1 + 8x_2 = -46$$
$$x^0 = \begin{pmatrix} x_1^0 \\ x_2^0 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

Jacobi:

1. Schritt

$$x_1^1 = (64 - 4x_2^0)/12 = (64 - 0)/12 = 5{,}33$$
$$x_2^1 = (-46 + 5x_1^0)/8 = (-46 + 0)/8 = -5{,}75$$

2. Schritt

$$x_1^2 = (64 - x_2^1)/12 = (64 - 4 \cdot -5{,}75)/12$$
$$= (64 + 23)/12 = 87/12 = 7{,}25$$

$$x_2^2 = (-46 + 5x_1^1)/8 = (-46 + 5 \cdot 5{,}33)/8$$
$$= (-46 + 26{,}65)/8 = -19{,}35/8 = -2{,}42$$

Gauß-Seidel:

1. Schritt

$x_1^1 = (64 - 4x_2^0)/12 = (64-0)/12 = 5,33$

$x_2^1 = (-46 + 5x_1^1)/8 = (-46 + 5 \cdot 5,33)/8$

$= (-46 + 26,65)/8 = -19,35/8 = -2,42$

2. Schritt

$x_1^2 = (64 - 4x_2^1)/12 = (64 - 4 \cdot -2,42)/12$

$= (64 + 9,68)/12 = 73,68/12 = 6,14$

$x_2^2 = (-46 + 5x_1^2)/8 = (-46 + 5 \cdot 6,14)/8$

$= (-46 + 30,7)/8 = -15,3/8 = -1,91$