Faculty of Mathematics
Institute for Analysis and Numerical Mathematics
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Magdeburg, 08.12.2003

Exercises to the classes
Numerical Methods in Sciences and Technics

Exercises no. 9

to 15.12.2003

The solution of exercise 1 is to submit in the exercise classes on Monday, 15.12.2003 !

Statements given in the lecture can be used in the solution of the exercises without proof. All other statements have to be proved.

1. Draw the graph of the matrix

$$A = \begin{pmatrix} 2 & 0 & 0 & -8 & 1 & 0 & 0 \\ 0 & 6 & 3 & 0 & 0 & -3 & 0 \\ 0 & -1 & 3 & 0 & 3 & 0 & 7 \\ -2 & 0 & 0 & 4 & 0 & 1 & 2 \\ -1 & 0 & -1 & 0 & 7 & -1 & 0 \\ 0 & -1 & 0 & -3 & -1 & 9 & 0 \\ 0 & 0 & -2 & -5 & 0 & 0 & 11 \end{pmatrix}.$$

2. Prove the statement

$$\|Se\|_1^2 = \|e\|_1^2 - \left((Q^T + Q - A)Q^{-1}Ae, Q^{-1}Ae\right).$$

   which occurs in the proof of the second lemma in Section 1.7.4.

3. Prove that the optimal value ω for the damped Jacobi-iteration with respect to the algebraic smoothing property is $\omega^* = 1/\eta$ (see the remark after the theorem in Section 1.7.4).