Faculty of Mathematics
Institute for Analysis and Numerical Mathematics
PD Dr. V. John
DM T. Mitkova

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Exercises to the classes
Numerical Methods in Sciences and Technics

Exercises no. 6

to 17.11.2003

The solution of exercise 2 is to submit in the exercise classes on Friday, 28.11.2003 !

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

1. Let $\eta_0(\nu)$ be the bound in the smoothing property of the damped Jacobi-iteration, see Section 1.5.3. Show that
$$\eta_0(\nu) \leq \frac{1}{\nu}.$$

2. Consider the multigrid γ-cycle with $\gamma = 3$ and with four levels in the multigrid hierarchy. Make a sketch of how one cycle of the multigrid method looks like.

3. Consider the proof of the convergence theorem for the multigrid γ-cycle with $\gamma \geq 2$. Show the last step in the proof in detail:
$$\|S_{mg,l}(\nu)\|_2 \leq \frac{\gamma}{\gamma - 1}\|S_l(\nu)\|_2.$$