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 $\gamma$-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 $\gamma$-cycle with $\gamma \geq 2$. Show the last step in the proof in detail:
   \[ \| S_{mg,i}(\nu) \|_2 \leq \frac{\gamma}{\gamma - 1} \| S_{i}(\nu) \|_2. \]