

Please send your solutions (including a MATLAB[®] implementation if applicable) by **Jan 23 (Magdeburg students)**, **Jan 19, 11:30 AM (Chemnitz students)** to przybilla@mpi-magdeburg.mpg.de (Magdeburg students) or jan.blechta@math.tu-chemnitz.de (Chemnitz students) with subject NLA-HW11. Late submissions are only possible if requested by email before the due date for a valid reason.

Numerical Linear Algebra – homework #11

Problem 1 (Lemma 7.2 from the lecture notes)

Let $\mu \in \Lambda(H)$, where H is an unreduced Hessenberg matrix (i.e. $h_{j+1,j} \neq 0, j = 1, \dots, n-1$) and $H - \mu I = QR$ a QR decomposition. Show, that for $\tilde{H} := RQ + \mu I$ it holds:

$$\tilde{h}_{n,n-1} = 0, \tilde{h}_{n,n} = \mu.$$

What happens if μ is not an eigenvalue but $\mu + e$ is for $\|e\| < \epsilon$?

Problem 2 (Symmetry in generalized eigenvalue problems)

Let $A = A^T$ and $B = B^T > 0$. The transformation to $B^{-1}A$ leads to a nonsymmetric eigenvalue problem. Derive a way to transfer the generalized eigenvalue problem

$$Ax = \lambda Bx$$

into a symmetric classic eigenvalue problem $Mx = \lambda x, M = M^T$.