

NUMERICAL LINEAR ALGEBRA
ACADEMIC YEAR 2007-2008

Theoretical assignments day 11

1. Show that the eigenvalues of the preconditioned matrix $M^{-1}A$ are solutions of the generalised eigenvalue problem $Ax = \lambda Mx$.
2. Show that the preconditioned matrices $M^{-1}A$, $L^{-1}AU^{-1}$ with $M = LU$, and AM^{-1} have the same spectrum.
3. On parallel computers we want to split the computations into large independent portions of computations. Why is this requirement difficult to combine with a good preconditioner?
4. Which orthogonalisation scheme should be used within GMRES on a distributed memory parallel computer? Explain your answer.
5. Propose an efficient algorithm to add together the results of the partial inner products on a distributed memory computer. Your algorithm should require as little communication as possible.