Quiz 05

Dec 23, 2014.

1. Let A be an $N^2 \times N^2$ matrix with $a_{ij} = 0$ except for $-N \le i - j \le 2N$ (only $3N+1$ diagonals have nonzero entries). Suppose that $Ax = b$ can be solved using Gaussian elimination without pivoting. Find the leading order operation count (multiplication/division only) CN^p for the elimination and backward substitution, respectively.

2. True or False? Give details.

   Let A be an $n \times n$ nonsingular matrix. If the linear system $Ax = b$ can be solved using Gaussian elimination without pivoting, then $A = LU$ where L is a lower triangular matrix with diagonal entries equal to 1 and U is an upper triangular matrix with nonzero diagonal entries.

3. Write a pseudo code for LU decomposition where L, U are as described above.

4. Find P, L, U in the factorization $PA = LU$ for the matrix

$$A = \begin{pmatrix} 0 & 0 & -1 & 1 \\ 1 & 1 & -1 & 2 \\ -1 & -1 & 2 & 0 \\ 1 & 2 & 0 & 2 \end{pmatrix} \tag{1}$$

   where P is a permutation matrix and L, U are as described above.

Numerical Analysis I, Fall 2014 (http://www.math.nthu.edu.tw/˜ wangwc/)

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