Quiz 04

Nov 25, 2011.

1. Prove that if A is non-singular, then the decomposition $A = LU$ with $l_{ii} = 1$, if it exists, is unique.
2. What is Cholesky decomposition? When does a matrix admit Cholesky decomposition? (Need not prove your statement).
3. Write a pseudo-code of Cholesky decomposition for a matrix that satisfies the requirement from problem 2 and is also a tridiagonal matrix. Give the number of multiplications/divisions to leading order (assuming that a square root amounts to 10 multiplications). Give your answer as CN^p, find C and p.
4. Let A be an 20×20 tridiagonal matrix with $a_{ii} = 5.1$, $a_{i+1,i} = a_{i,i+1} = 2$ and $a_{ij} = 0$ otherwise. Show that Gaussian elimination on A is the same as Gaussian elimination with partial pivoting.
5. Let $b = (1, \cdots, 1)'$ and A as above. Use the octave built-in function to get LU decomposition for A. Find $z = U^{-1}b$ via forward/backward (you have to decide which) substitution. Then compute $\max(\text{abs}(U * z - b))$. Copy your code (carefully) and $\max(\text{abs}(U * z - b))$ on the answer sheet.

Numerical Analysis I, Fall 2011 (http://www.math.nthu.edu.tw/˜ wangwc/)

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