Math 630 - Linear Algebra and Its Applications

Instructor: Prof. X. Sheldon Wang

Quiz 1

(Closed book)

Assigned: 8:00pm, Feb. 3, 2005
Due: 9:00pm, Feb. 3, 2005

Problem 1 (25 points)

Which values of a, b, c lead to row exchanges, and which make the matrices singular?

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 0 \\ a & 8 & 3 \\ 0 & b & 5 \end{bmatrix} \text{ and } \mathbf{A} = \begin{bmatrix} c & 2 \\ 6 & 4 \end{bmatrix}.$$

Problem 2 (25 points)

Find the symmetric factorization $\mathbf{A} = \mathbf{LDL}^T$ of

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 6 & 4 \\ 0 & 4 & 11 \end{bmatrix} \text{ and } \mathbf{A} = \begin{bmatrix} a & b \\ b & c \end{bmatrix}.$$

Problem 3 (25 points)

Using Gauss-Jordan method to computer

$$\begin{bmatrix} 1 & 0 & 0 \\ l & 1 & 0 \\ m & 0 & 1 \end{bmatrix}^{-1} \text{ and } \begin{bmatrix} 1 & 0 & 0 \\ l & 1 & 0 \\ m & n & 1 \end{bmatrix}^{-1}.$$

Problem 4 (25 points)

Solve $\mathbf{Ax} = \mathbf{b}$ by solving the triangular systems $\mathbf{Lc} = \mathbf{b}$ and $\mathbf{Ux} = \mathbf{c}$:

$$\mathbf{A} = \mathbf{LU} = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 2 & 2 & 4 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}.$$

What part of $\mathbf{A}^{-1}$ have you found, with this particular $\mathbf{b}$?