Numerical Methods for Engineering – Graduate Course 019003

Prep HW 1: Linear systems

Due date: before next lecture (on Moodle)

1. Solve (manually by hand) the linear system defined by this augmented matrix. Use the Gauss method with row pivoting. Why is the row pivoting important?

$$(A|b)=\left(\begin{array}{cccc|c} 1 & 2 & 3 & 4 & 3 \\ 0 & 1 & 2 & 3 & 1 \\ 1 & -1 & 0 & 0 & 1 \\ -1 & -2 & 3 & 2 & 3 \end{array}\right)$$

2. Solve the next system of equations (manually by hand) using the LU decomposition method (Doolittle):

$$\left(\begin{array}{ccc|c} 1 & 7 & -4 & -51 \\ 4 & -4 & 9 & 62 \\ 12 & -1 & 3 & 8 \end{array}\right)$$

3. Solve the next system of equations (manually by hand) using the Thomas (LU for tri-diagonal matrices):

$$\left(\begin{array}{ccc} 2 & -1 & \\ -1 & 2 & -1 \\ & -1 & 2 \end{array}\right)\left(\begin{array}{c} x_1 \\ x_2 \\ x_3 \end{array}\right)=\left(\begin{array}{c} 124 \\ 4 \\ 14 \end{array}\right)$$