Tutorial 3

1. Solve the following system of equations by Gauss Elimination, Doolittle method, Crout method and Cholesky decomposition:

$$\begin{bmatrix} 9.3746 & 3.0416 & -2.4371 \\ 3.0416 & 6.1832 & 1.2163 \\ -2.4371 & 1.2163 & 8.4429 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 9.2333 \\ 8.2049 \\ 3.9339 \end{bmatrix}$$

2. Solve the following system of equations using Thomas algorithm:

$$\begin{bmatrix} 1 & -1 & 0 & 0 \\ -1 & 2 & -1 & 0 \\ 0 & -1 & 2 & -1 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 2 \\ 1 \end{bmatrix}$$

3. Consider the following set of equations:

$$\begin{bmatrix} 0.123 & 0.345 & 2.00 \\ -2.34 & 0.789 & 1.98 \\ 12.3 & -5.67 & -0.678 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6.81 \\ 5.17 \\ -1.08 \end{bmatrix}$$

   a) Solve the system using Gaussian elimination, without pivoting, using 3-digit floating-point arithmetic with round-off. Perform calculations more precisely but round-off to 3 significant digits when storing a result, and use this rounded-off value for further calculations.

   b) Perform partial pivoting and carry out Gaussian elimination steps once again using 3-digit floating-point arithmetic with round-off. Comment on the results.