RULES

1. Solutions of Exercises 2.0 are also posted.
2. This is the **version 2.0**. In case there are any corrections for this exercise, we will post an updated version on our website. You can follow the changes in the exercises by the **Version History** section below.

Version History

v2.0 Exercise is released.

1. Answer the following questions.

a. Write the set of equations in matrix form:

$$50 = 5c - 7b$$
$$4b + 7c + 30 = 0$$
$$a - 7c = 40 - 3b + 5a$$

b. Is this system consistent? Show justification of your answer.

2. Solve the following system of linear equations with LU decomposition using Doolittle's algorithm. Carry out your calculations with 6 decimal places. Make your solution by hand; afterwards check your result using MATLAB.

(Hint: There is a special function in MATLAB for LU decomposition i.e. for decomposing matrix A you can use `[L U]=lu(A)` command.).

$$8x_1 - x_2 + 3x_3 - 25 = 0$$
$$3x_1 + 24x_2 + 5x_3 - 2x_4 - 87 = 0$$
$$x_1 - 8x_2 - 16x_3 - 3x_4 + 108 = 0$$
$$3x_1 - 2x_2 - x_3 + 10x_4 + 9 = 0$$

3. Solve the following system of equations with an error tolerance of 10^{-2} and initial guess of $x^T = \begin{bmatrix} x_1^0 & x_2^0 & x_3^0 \end{bmatrix} = [1.4 \quad 0.4 \quad 1.9]$ using

a) Gauss Jacobi method.

b) Gauss Seidel method.

c) Compare the results of these two methods in terms of speed of convergence (or number of iterations) and briefly comment on the difference.

$$3x_1 - x_2 + x_3 = 6$$
$$-x_1 + 3x_2 - 2x_3 = -4$$
$$2x_2 + 3x_3 = 7$$

Hint: $\text{Error} = \max(|x_j^{k+1} - x_j^k|)$, $j = 1, 2, 3$. Use 4 decimal places in your calculations.