Rules

This mini-project represents the homework assignement proposed in this course. The mini-project is compulsory and the corresponding grade will be computed in the final mark as per the course policy detailed in the syllabus.

The mini-project must be carried out **individually** or in **groups of two students**. You must return a report and the Matlab/Octave code used. Please include in the report all numerical results obtained by running your code and figures showing convergence. The report (**report-YourID.pdf**) AND source code (**program-YourID.m**) must be sent by email. You also need to send me the command lines used to run the code and get the solution of the linear system.

All should be send in a **single email**. The object of the email should be in this form: "**FirstName LastName, Your KU ID, Project**". (Example: *Louis Lagrange, 10055777, Project*)

The deadline for this mini-project is fixed on Wednesday 12th April 2023, 05:00 PM.

Exercise 1

1. Write a Mathlab/Octave program to iteratively solve the system of linear equations A*X=B using either Jacobi or Gauss-Seidel methods. A is a $N \times N$ square matrix. Consider a tolerance "tol" for the stopping test.

2. Choose an initial guess and use the program to solve the following linear system. Consider a tolerence tol=10^{-12}.

$$\begin{aligned} 3x + 20y - z &= -18 \\ 2x - 3y + 20z &= 25 \\ 20x + y - 2z &= 17. \end{aligned}$$

3. Plot the evolution of the relative error up to the convergence.

Exercise 2

The air temperature near the ground depends on the concentration K of the carbon acid therein. The following Table (taken from Philosophical Magazine 41, 237 (1896)) reports for different latitudes on the Earth and for $K = 0.67$, the variation $\delta_K = T - T_{\bar{K}}$ of the average temperature with respect to the average temperature corresponding to a reference value $\bar{K}$ of K. Here $\bar{K}$ refers to the value measured in 1896, and is normalized to one.

Lattitude	δ_K
65	-3.1
55	-3.22
45	-3.3
35	-3.32
25	-3.17
15	-3.07
5	-3.02
-5	-3.02
-15	-3.12
-25	-3.2
-35	-3.35
-45	-3.37
-55	-3.25

Table 1: Variation of the average yearly temperature on the Earth for the concentration K=0.67 of carbon acid at different latitudes

1. Use the Matlab/Octave commmands **polyfit** and **polyval** to obtain the interpolating polynomial for the data in Table 1 using only the values of the temperature for the latitudes 65, 35, 5, -25, -55.
2. Plot the data in Table 1 and the interpolating polynomial of degree 4 in the same graph.