1. Given the system of equations

$$\begin{aligned} 3x_1 + x_2 - x_3 &= 3 \\ x_1 - 4x_2 + 2x_3 &= -1 \\ -2x_1 - x_2 + 5x_3 &= 2 \end{aligned}$$

   (a) Use Jacobi to compute $\vec{x}_1$ by hand when $\vec{x}_0 = (0, 0, 0)$.

   (b) Use Gauss-Seidel to compute $\vec{x}_1$ by hand when $\vec{x}_0 = (0, 0, 0)$.

2. Given the system of equations

$$\begin{aligned} 3x_1 + x_2 - x_3 &= 3 \\ x_1 - 4x_2 + 2x_3 &= -1 \\ -2x_1 - x_2 + 5x_3 &= 2 \end{aligned}$$

   (a) Use Jacobi to compute $\vec{x}_7$ using numpy when $\vec{x}_0 = (0, 0, 0)$. Round your answer to five decimal places. Guess if this FPI converges. To what? Is it the solution to $Ax = b$?

   (b) Use Gauss-Seidel to compute $\vec{x}_7$ using numpy when $\vec{x}_0 = (0, 0, 0)$. Round your answer to five decimal places.

   (c) Use SOR with $\omega = 1.2$ to compute $\vec{x}_4$ using numpy when $\vec{x}_0 = (0, 0, 0)$. Round your answer to five decimal places.

3. Given the system of equations

$$\begin{aligned} 3x_1 + x_2 - x_3 &= 3 \\ x_1 - 4x_2 + 2x_3 &= -1 \\ -2x_1 - x_2 + 5x_3 &= 2 \end{aligned}$$

   (a) Here is yet another FPI $x = g(x) = (I - A)x + b$.

   (b) Verify that a fixed point of this FPI is a solution to $Ax = b$.

   (c) Find $\vec{x}_1$ and $vecx_7$ when $\vec{x}_0 = (0, 0, 0)$. (write your own python code to find $\vec{x}_7$).

   (d) What is happening with this FPI sequence?

4. textbook exercises $2, 3, 6$.