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) Jacobi: $\vec{x}_0 = (0,0,0), \vec{x}_1 = (1, .25, .4), \ldots, \vec{x}_7 = (1.00038, 1.00122, .99985)$. Converges to $(1,1,1)$ which is indeed the solution.

   (b) Gauss-Seidel: $\vec{x}_0 = (0,0,0), \vec{x}_1 = (1, 0.5, 0.9), \ldots, \vec{x}_7 = (1.00015, .99997, 1.00005)$.

   (c) SOR: $\vec{x}_0 = (0,0,0), \vec{x}_4 = (1.01776, 1.01520, 1.01154)$.

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) 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 $Ax = b$. Solve for Ax in $x = x - Ax + b$. You'll get $Ax = b$.

   (c) Find $\vec{x}_1 = (3, -1, 2)$ and $vecx_7 = (6069, -40300, -5665)$ when $\vec{x}_0 = (0,0,0)$.

   (d) What is happening with this FPI sequence? ANSWER: diverging.