Norwegian University of Science
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Department of Mathematical
Sciences

TMA4122
Matematikk 4M
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Exercise set 9

In all problems you are supposed to show the details of your work and describe what you are doing.

1 Use Gaussian elimination with partial pivoting to solve the system of linear equations using only 3 significant digits.

$$\begin{aligned} 0.143x_1 + 0.357x_2 + 2.01x_3 &= -5.17 \\ -1.31x_1 + 0.911x_2 + 1.99x_3 &= -5.46 \\ 11.2x_1 - 4.30x_2 - 0.605x_3 &= 4.42 \end{aligned}$$

2 Show the LU-decomposition and solve the following linear system.

$$\begin{aligned} 2x_1 + x_2 + 2x_3 &= 0 \\ -2x_1 + 2x_2 + x_3 &= 0 \\ x_1 + 2x_2 - 2x_3 &= 18 \end{aligned}$$

3 Do 4 steps of the Gauss-Seidel iteration, starting with $x^{(0)} = (0, 0, 0)^t$ and using 6 significant digits, of the following linear system

$$\begin{aligned} 4x_1 + 5x_3 &= 12.5 \\ x_1 + 6x_2 + 2x_3 &= 18.5 \\ 8x_1 + 2x_2 + x_3 &= -11.5 \end{aligned}$$

4 Do 4 steps of the Jacobi iteration, starting with $x^{(0)} = (0, 0, 0)^t$ and using 6 significant digits, of the following linear system

$$\begin{aligned} x_1 - 0.01x_2 &= 2.5 \\ -0.2x_1 + x_2 + 0.1x_3 &= 8.5 \\ 0.3x_2 + x_3 &= -1.5 \end{aligned}$$

Does this iteration converges to a solution of the system?