

DEN Homework # 12

Solve the problems and then bring your work to the lab in the last week of school.

1. We are given the following system:

$$x + 2z = -2$$

$$3x + y - z = 9$$

$$x + 4y + z = 4.$$

By the way, its solution is $x = 2$, $y = 1$, $z = -2$.

a) Rewrite this system into a form suitable for the Jacobi iterative method. Given the initial vector $x_0 = y_0 = z_0 = 0$, calculate the next three iterations of the Jacobi iteration. Do you get the feeling that it would converge to the solution?

b) Apply the Gauss-Seidel iteration to this system. Namely, calculate the first two iterations given the initial vector $x_0 = y_0 = z_0 = 0$. Add a remark outlining the key difference compared to the Jacobi iteration at a suitable place.

c) Reorder the system so that the Jacobi and Gauss-Seidel iterations have a high chance of success. Explain what shape of a system you are trying to achieve.

d) Apply the Jacobi iteration to the reordered system and calculate the next three iterations based on the initial vector $x_0 = y_0 = z_0 = 0$. Does it look hopeful?

e) Apply the Gauss-Seidel iteration to the reordered system and calculate the next two iterations based on the initial vector $x_0 = y_0 = z_0 = 0$. Does it look hopeful?