ENME303, Fall 2021 (T.Wu)

UMBC

Assignment Week15

Gauss-Seidel Method (0 pts)

The entire assignment is MATLAB.

Problem	1	2	3
Points	(0)	(0)	(0)

1. Show that the Guass-Seidel method diverges for the system using the initial approximation $(x_1, x_2, x_3) = (0, 0, 0)$. Show each iteration result up to the 15th iteration with 4 significant digit in every intermediate step.

$$2x_1 - 3x_2 + 0x_3 = -7 \quad (1)$$
$$x_1 + 3x_2 - 10x_3 = 9 \quad (2)$$
$$3x_1 + 0x_2 + x_3 = 13 \quad (3)$$

   Hint: MATLAB offers different display format. `format rational` may be the easiest way for human eyes to read.

2. Interchange the rows of the system of linear equation in the previous problem to obtain a system with a strictly diagonally dominant coefficient matrix. Then apply the Gauss-Seidel method to approximate the solution to two significant digits.

3. The is the same linear system you see in the partial pivoting lecture except the sequence of the equations have been rearranged. Use Gauss-Sidel method to find the solution to four significant digits. All the variables are zero at the initial guess.

$$11.2x_1 - 4.30x_2 - 0.605x_3 = 4.415 \quad (4)$$
$$-1.31x_1 + 0.911x_2 + 1.99x_3 = -5.458 \quad (5)$$
$$0.143x_1 + 0.357x_2 + 2.01x_3 = -5.173 \quad (6)$$

   (a) Display the solution at the 10th iteration.

   (b) Display the solution at the 50th iteration.

   (c) Display the solution at the 200th iteration.

   (d) Display the solution at the 400th iteration.

   (e) Display the solution at the 700th iteration.

   (f) How many iterations does the system take to converge?