ME EN 2450 Assignment HW 3b

Name: _____

Due: _____

I declare that the assignment here submitted is original except for source material explicitly acknowledged.

I also acknowledge that I am aware of University policy and regulations on honesty in academic work, and of the disciplinary guidelines and procedures applicable to breaches of such policy and regulations, as contained in the University website.

_____ _____

Name   Date

_____ _____

Signature   Student ID

Score

: Total: | /30

Q1

(10 pts) Given the equations

$$5x_1 + 1x_2 - 0.5x_3 = 13.5$$
$$-6x_1 - 12x_2 + 4x_3 = -123$$
$$2x_1 + 2x_2 + 10x_3 = -43$$

(a) Solve by hand using Gauss Elimination. Show all steps of the calculation.

(b) Substitute your results in to the original equations to check your answers.

(c) Write a Gauss Elimination code and solve the problem. Verify your implementation.
NOTE: Your code should be general enough to handle an n-by-n system for any n.
Pivoting and scaling are both optional.

Q2

(10 pts.) Solve the following system of equations **by LU decomposition:**

$$8x_1 + 4x_2 - x_3 = 11$$
$$-2x_1 + 5x_2 + x_3 = 4$$
$$2x_1 - x_2 + 6x_3 = 7$$

a) by hand

b) using a python or matlab script that you write.
NOTE: Your code should be general enough to handle an n-by-n system for any n.
Pivoting and scaling are both optional.

c) Make a statement about verification based on the results of (a) and (b).

Q3

(10 pts.) Use the Gauss-Seidel method to solve the following system until the approximate relative error falls below $\epsilon_A = .0005$. **If necessary, rearrange the equations to achieve convergence.**

$$-3x_1 + x_2 + 12x_3 = 50$$
$$6x_1 - x_2 - x_3 = 3$$
$$6x_1 + 9x_2 + x_3 = 40$$

a) using a built-in function in matlab (linsolve) or python (numpy.linalg.solve)

b) using a python or matlab script of Gauss-Seidel method that you write.

c) what goes wrong, if anything, if the equations are not reordered?