# EE 271 - Hwk on matrices

Due Oct. 21, 2019

1. The flowchart illustrates a program to solve linear equations. Write a MATLAB script file that implements the corresponding algorithm. The pseudocode for the linear equation solver follows (taken from text)

```
If the rank of A equals the rank of [A b], then
   determine whether the rank of A equals the number of unknowns.
   If so, there is a unique solution, which can be computed using
   left division. Display the results and stop.
   Otherwise, there are an infinite number of solutions, which can
   be found from the augmented matrix. Display the results and stop.
Otherwise (if the rank of A does not equal the rank of [A b]), then
there are no solutions. Display this message and stop.
```
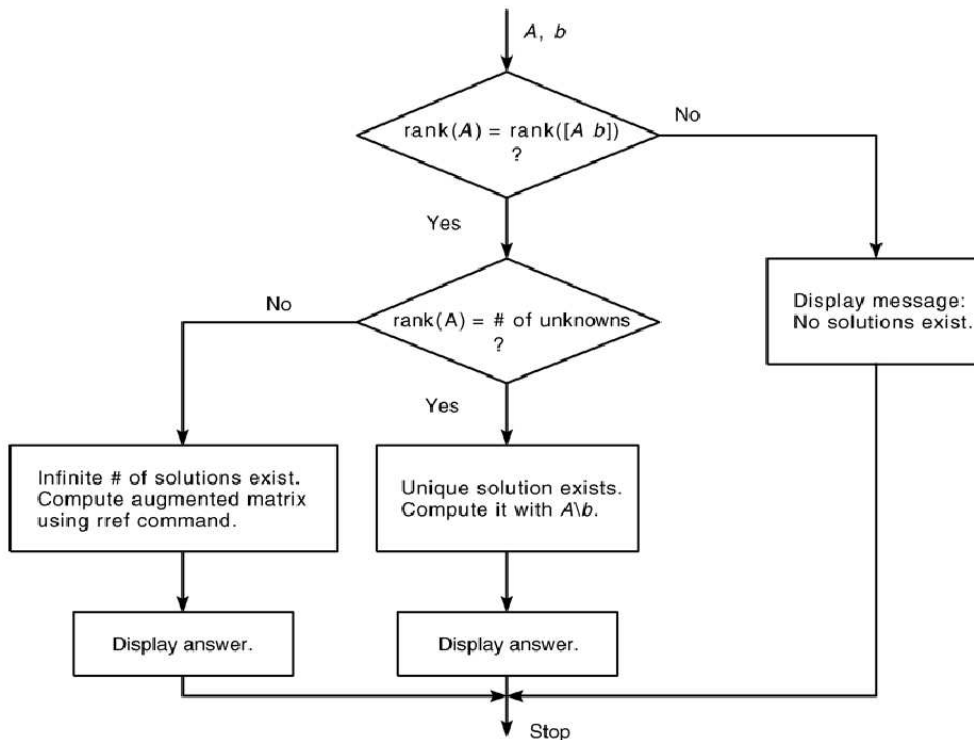
2. (a) Use Matlab to solve the following equations for x, y and z as functions of the parameter c.

$$\begin{aligned} x - 5y - 2x &= 11c \\ 6x + 3y + z &= 13c \\ 7x + 3y - 5z &= 10c \end{aligned}$$

(b) Plot the solutions for x, y, and z versus c on the same plot, for $-10 \le c \le 10$.

(**Note**:

For the solution $\mathbf{A}^{-1}\mathbf{b}$, vector $\mathbf{x}$ is proportional to the vector $\mathbf{b}$. We can use this linearity property to obtain a more generally useful algebraic solution in cases where the right-hand sides are all multiplied by the same scalar. For example, suppose the matrix equation is $\mathbf{Ay} = \mathbf{b}c$, where c is a scalar. The solution is $\mathbf{y} = \mathbf{A}^{-1}\mathbf{b}c = \mathbf{x}c$. Thus if we obtain the solution to $\mathbf{Ay} = \mathbf{b}$, the solution to $\mathbf{Ay} = \mathbf{b}c$ is given by $\mathbf{y} = \mathbf{x}c$.)

3. Solve the following equations:

$$\begin{aligned} 7x + 9y - 9z &= 22 \\ 3x + 2y - 4z &= 12 \\ x + 5y - z &= -2 \end{aligned}$$