Instructions for preparing the solution script:

- Write your name, ID#, and Section number clearly in the very front page.
- Write all answers sequentially.
- Start answering a question (not the part of the question) from the top of a new page.
- Write legibly and in orderly fashion maintaining all mathematical norms and rules. Prepare a single solution file.
- Start working right away. There is no late submission form. If you miss the deadline, you need to use the make-up assignment to cover up the marks.

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1. A linear system is described by the following equations.

$$\begin{aligned} 2x - 2y + z &= -3 \\ x + 3y - 2z &= 1 \\ 3x - y - z &= 2 \end{aligned}$$

   (a) (3 marks) From the given linear equations, identify the matrices A, x and b such the the linear system can be expressed as a matrix equation.

   (b) (2 marks) Does this system have any unique solution? Explain.

   (c) (6 marks) Evaluate the upper triangular matrix U by Gaussian elimination method. Note that you have to show the row multipliers m_{ij} for each step as necessary.

   (d) (4 marks) Using the upper triangular matrix found in the previous question, compute the solution of the given linear system by Gaussian elimination method.

2. A linear system is described by the following equations.

$$\begin{aligned} x + 2y - z &= 0 \\ 2x - y + z &= 1 \\ -x + y + 2z &= 2 \end{aligned}$$

   (a) (2 marks) From the given linear equations, identify the matrices A. Examine if the matrix A has any pivoting problem? Explain why or why not?

   (b) (4 marks) State how many Frobenius matrices, $F^{(i)}$, $i = 1, 2, \cdots$, can be computed, and evaluate them for the given system.

   (c) (3 marks) Evaluate the unit lower triangular matrix L, and the upper triangular matrix U.

   (d) (6 marks) Now compute the solution of the given linear system using LU-decomposition method. Use the matrices L and U found in the previous question. Show your works.