<u>Math503-Exam-I-KFUPM-Term241-Dr. Jamal ☺</u>

<u>Name/ID</u>:

<u>Question 1</u>: Consider the linear system:

$$x + y + z = 0$$

$$x + 2y + 2z = 0$$

$$3x + by + 4z = a$$

Use Gaussian Elimination to find all possible values of a and b that make the system to

a) have a unique solution,
b) have infinitely many solutions,
c) be inconsistent [no solution].

<u>Question 2</u>: Write an LU factorization without pivoting for

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 2 & 3 \end{pmatrix}.$$

<u>Question 3</u>: Given that M is a "large" number, use an appropriate method for obtaining an accurate numerical solution for the system:

$$x + My = M$$

$$x + y = 2.$$

Question 4 A function $f(x) = x^3 + x^2 + ax + b$ satisfies the points $P_1(1, 3)$, $P_2(-1, -3)$.

a) Write a linear system for finding the coefficients a and b.

b) Use Gaussian Elimination to solve the linear system.

<u>Question 5</u>: Solve the linear system using Front/Back Substitutions,

$$\begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 4 \\ 4 \\ 3 \end{pmatrix}.$$

<u>Question 6</u>: Consider the following matrix:

$$A = \begin{pmatrix} 1 & 1 & 0 & 1 & 0 \\ 1 & 2 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$

Use the properties of Block Matrices to find

a) $\det(A)$
b) A^{-1}
c) (x_3, x_4, x_5) satisfying $AX = (1 \quad 2 \quad 0 \quad -1 \quad -2)^t$

Enjoy it 😊 *Dears*