MTH 309-4 **Linear Algebra I** **F11**

Recitation 1

(A) Consider the following system of equations:

$$\begin{aligned} x_1 + x_2 + x_3 + x_4 + x_5 &= 7 \\ 3x_1 + 2x_2 + x_3 - x_4 - 3x_5 &= 2 \\ x_2 + 2x_3 + 2x_4 + 6x_5 &= 23 \\ 5x_1 + 4x_2 + 3x_3 + 3x_4 - x_5 &= 12 \end{aligned}$$

(A1) Determine the augmented matrix of the linear system:

(A2) Find the reduced echelon form of the augmented matrix in (A):

(A3) Determine the solution set of the linear system in (A):

(A4) Change the last equation in the system of (A) into:

$$5x_1 \quad + \quad 4x_2 \quad + \quad 3x_3 \quad + \quad 3x_4 \quad - \quad x_5 \quad = \quad 10.$$

Determine the augmented matrix of the new system and find its reduced echelon form:

(A5) What is the solution set of the new system?

(B) Determine the value(s) of h such that the matrix is the augmented matrix of a linear system of equations whose solution set is not the empty set:
(B1)

$$\begin{bmatrix} 1 & h & -3 \\ -2 & 4 & 6 \end{bmatrix}$$

(B2)

$$\begin{bmatrix} 2 & -3 & h \\ -6 & 9 & 5 \end{bmatrix}$$

(C) *True or False?* Justify your answer:

(C1) Every reduced echelon form of a nonzero matrix has leading entry 1.
True - False?
REASON:

(C2) Every reduced echelon form of a nonzero matrix has (1, 1)-entry 1.
True - False?
REASON:

(C3) The echelon form of a matrix is unique.
True - False?
REASON:

(C4) Whenever a system has a free variable, the solution set contains infinitely many solutions.
True - False?
REASON:

(C5) A homogeneous system of 5 linear equations and 6 unknowns has at least one nontrivial solution.
True - False?
REASON:

(C6) A homogeneous system of 6 linear equations and 5 unknowns has at least one nontrivial solution.
True - False?
REASON: