Linear Algebra
Assignment 3 MATH 2318 (Fall 2022)

Deadline: Friday September 16th, 11:59pm.

Policy to turn in assignment:

- Assignment should be submitted via BlackBoard.
- Student needs to turn in their assignment as a single PDF file.
- No email or late submission will be accepted.

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3 points 1. Let

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ -1 & -5 & 0 & 1 \\ 1 & 3 & 1 & 0 \end{bmatrix}.$$

Do the columns of A span $\mathbb{R}^3$? Explain.

6 points 2. Let $A = \begin{bmatrix} 1 & -3 & -1 & 1 & -1 \\ 2 & -6 & 1 & -3 & -9 \\ -2 & 6 & 3 & 2 & 11 \end{bmatrix}$.

a) Solve the equation $A\vec{x} = \vec{b}$, where $\vec{b} = \begin{bmatrix} -1 \\ 9 \\ 0 \end{bmatrix}$. Write the solution in parametric form and in vector parametric form.

b) Multiply A by the vector parametric form of the solution that you found in part a) and verify that the result is the vector $\vec{b}$.

c) **Without performing any row operations**, find the vector parametric form of the solution of $A\vec{x} = \vec{0}$. If you perform row operations again, no points will be awarded. *Hint*: Use part a).

4 points 3. For each of the following, determine if the statement is true or false. Provide a short reasoning (one or two sentences).

a) If a matrix has m rows and n columns, with $m > n$, the columns of the matrix cannot span $\mathbb{R}^m$.

b) A consistent equation $A\vec{x} = \vec{b}$ where A has more columns than rows can have a unique solution.

c) If the REF of the augmented matrix of a consistent equation $A\vec{x} = \vec{b}$ has a row of zeros, then the equation has infinitely many solutions.

d) If a consistent equation $A\vec{x} = \vec{b}$, where A is a square matrix, has infinitely many solutions, then the REF of the augmented matrix has a row of zeros.