Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S6: Winter 2019

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Quiz 1

This quiz is graded out of 13 marks. No books, watches, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. §1.1 TF Determine whether the statement is true or false, and justify your answer.

a. *(2 marks)* Multiplying a row of an augmented matrix through by zero is an acceptable elementary row operation.

False, by the definition the constant must be non-zero.

Question 2. *(3 marks)* §1.1 #20a) Find all values of k for which the given augmented matrix corresponds to a consistent linear system.

$$\begin{bmatrix} 3 & -4 & k \\ -6 & 8 & 5 \end{bmatrix}$$

$$\begin{cases} 3x - 4y = k \\ -6x + 8y = 5 \end{cases}$$

$$\begin{cases} y = \frac{3}{4}x - \frac{k}{4} \\ y = \frac{3}{4}x + \frac{5}{8} \end{cases}$$

The system will be consistent if there is at least a point in common between the graph of both lines.

Note that both lines are parallel. So we have at least an intersection when the y-intercept of both lines are equal.

That is $-\frac{k}{4} = \frac{5}{8}$

$k = -\frac{5}{2}$

Question 2. *(3 marks)* Given the linear system $\begin{cases} x - y + z = b_1 \\ 2x - 2y - 2z = b_2 \\ x + 3y - 5z = b_3 \end{cases}$. Determine the b_i if the linear system has the particular solution $(3, -2, 1)$.

The solution must satisfy the system

$b_1 = 3 - (-2) + 1 = 6$

$b_2 = 2(3) - 2(-2) - 2(1) = 8$

$b_3 = 3 + 3(-2) - 5(1) = -8$

Question 3. *(3 marks)* You have a system of k equations in two variables, $k \geq 2$. Explain the geometric significance of

a. No solution.

K lines with no single common intersection. There might be intersections between the lines but no common intersection.

b. A unique solution.

K lines that have a unique common intersection.

c. An infinite number of solutions.

K lines that are identical. Hence all their points are in common.

Question 4. *(2 marks)* Is there a two-unknowns linear system whose solution set is all of $\mathbb{R}^2$?

Yes, $0x + 0y = 0$, all $(x, y) \in \mathbb{R}^2$ satisfy the equation.