Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S5: Fall 2024: **Quiz 1** name: _____

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531**. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. *(3 marks each)* Determine whether the following statement is true or false. If the statement is false provide a counterexample. If the statement is true provide a proof of the statement.

a. Consider a system of linear equations with augmented matrix A. If there is more than one solution, A has a row of zeros.

b. Multiplying a row of an augmented matrix through by zero is an acceptable elementary row operation.

Question 2. *(3 marks)* Find (if possible) conditions on a and b such that the system has no solution, one solution, and infinitely many solutions. Justify.

$$\begin{cases} x & +ay = 1 \\ 2x & +by = 2 \end{cases}$$

Question 3. *(2 marks)* Consider the following augmented matrix of a consistent linear system.

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

Find a row which can be removed to the augmented matrix to make a new system with two equations that has infinitely many solutions. Justify.

Question 4. *(2 marks)* Illustrate and describe in terms of slope and intercept **all** relative positions of lines in a consistent linear system consisting of two lines.

Question 5. *(2 marks)* Find the linear equation whose solution set it $(x, y, z) = (4, 0, 0) + s(2, 1, 0) + t(3, 0, 1)$ where $s, t \in \mathbb{R}$.