Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S7: Fall 2022: **Quiz 8** 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. *(5 marks)* Given A, an $n \times n$ matrix such that $\det(A) = 9$ and

$$A^3A^T = 3A^{-1}\text{adj}(A)$$

find n.

Question 2. *(3 marks)* Using Cramer's Rule find x_1 and x_3 for $A\mathbf{x} = \mathbf{b}$ where $A = \begin{bmatrix} \sin\theta & -\cos\theta & \sin\theta \\ \cos\theta & \sin\theta & \cos\theta \\ 0 & 0 & 1 \end{bmatrix}$ and $\mathbf{b} = \begin{bmatrix} 2\sin\theta \\ 2\cos\theta \\ 2 \end{bmatrix}$.

Question 3. Determine whether the following statements are true or false for any $n \times n$ matrices A and B. If the statement is false provide a counterexample. If the statement is true provide a proof of the statement.

1. *(3 marks)* There is no 3×3 matrix for which $A^2 + I_3 = 0$.

Bonus Questions. *(5 marks)* Show that the following two statements are equivalent:

S1. P, Q, and $P+Q$ are all invertible and $(P+Q)^{-1} = P^{-1} + Q^{-1}$

S2. P is invertible and $Q = PG$ where $G^2 + G + I = 0$.