Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S5: Fall 2024: **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. *(3 marks)* Determine whether each statement is true or false. If the statement is false provide a counterexample. If the statement is true provide a proof.

If $\mathbf{v}_1 = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$ and $\mathbf{v}_2 = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$, then for any nonzero 2×2 matrix A, the set $\{A\mathbf{v}_1, A\mathbf{v}_2\}$ is linearly independent.

Question 2. *(5 marks)* Find a basis and dimension of $W = \text{span}\left\{ \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}, \begin{bmatrix} -3 & 3 \\ -6 & 0 \end{bmatrix}, \begin{bmatrix} 8 & 7 \\ 1 & 0 \end{bmatrix} \right\}$.

Question 3. *(5 marks)* Let $W = \{a+bx+cx^2+dx^3 \in P_2 \mid 2a-b+3c-d=0\}$. Find a basis and the dimension of W. Find the coordinates vector of $p(x) = 2-x+x^2+8x^3$ relative to the basis.

Question 4. *(5 marks)* Let $\mathbf{u}$, $\mathbf{v}$, $\mathbf{p}$, $\mathbf{q}$ be nonzero vectors in $\mathbb{R}^3$, such that $\operatorname{span}\{\mathbf{u},\mathbf{v}\} = \operatorname{span}\{\mathbf{p},\mathbf{q}\}$. Show that $(\mathbf{u}\times\mathbf{v})\times(\mathbf{p}\times\mathbf{q}) = \mathbf{0}$.