Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S6: Fall 2024: **Quiz 5** 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)* Let **u** and **v** be unit vectors, such that the angle between them is $\frac{2\pi}{3}$. Find $||5\mathbf{u} - 2\mathbf{v}||$.

Question 2. *(5 marks)* Given a parallelogram with vertices A, B, C and D where $A(2,-2,4)$ and where the sides of the parallelogram are parallel to $\vec{u} = (1,2,3)$ and $\vec{v} = (-3,2,5)$. Find a set of vertices B, C and D.

Question 3. *(5 marks)* Consider two 4×4 matrices A and B, with $\det(\text{adj}(AB)) = -8$ and $\det(B) = 3$. Find the determinant of M, given

$\det(\det(B)B^T MA^{-1}) = \det(5\text{adj}(B)A^2)$.

Question 4. *(3 marks)* 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.

If A, B and C are $n \times n$ matrices such that $A\mathbf{x} = \mathbf{0}$ has infinitely many solutions then $(A^T C^{-1} + (BA)^T)\mathbf{x} = \mathbf{0}$ has infinitely many solutions.