Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S6: Fall 2024: **Quiz 7** 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. If the volume of the parallelepiped determined by the vectors $2\mathbf{u}+3\mathbf{v}$, $3\mathbf{v}-\mathbf{w}$, and $\mathbf{u}-\mathbf{v}$ is equal to 20.

a. *(5 marks)* Find all the values of the scalar triple product $\mathbf{w}\cdot(\mathbf{v}\times\mathbf{u})$.

Question 2. *(5 marks)* Show that the lines $(L_1):\begin{cases} x=3+t \\ y=5+t \\ z=2+t \end{cases}$, and $(L_2):\begin{cases} x=-1+2s \\ y=1+s \\ z=s \end{cases}$, $t,s\in\mathbb{R}$ are skew lines, and find the distance between them.

Question 3. *(4 marks)* Let $W = \left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} \in M_{22} \;\middle|\; 2a - b + 3c - d = 0 \right\}$. Determine whether W is a subspace of M_{22}.

Question 4. *(3 marks)* Show that the additive inverse of any vector in a vector space is unique. *Show every step, justify every step, and cite the axiom(s) used!!!*

Question 5. *(2 marks)* Determine whether $U = \{(r,\ 0,\ s) | r^2 + s^2 = 2 \text{ and } r,\ s \in \mathbb{R}\}$ is a vector space with the usual operations in $\mathbb{R}^3$.