Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S5: 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. Consider the points $A(2,-2,4)$, $B(4,-1,1)$, and $C(3,-1,2)$.

a. *(3 marks)* Find the area of the triangle ABC.

b. *(3 marks)* Find the exact value of the tangent of the angle at the vertex A of the triangle ABC.

Question 2. *(5 marks)* Given that the following 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. Find the equation of the line that intersects (L_1) and (L_2) at right angles.

Question 3. *(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 4. *(4 marks)* Let $W = \left\{ A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \in M_{22} \;\middle|\; AB = BA \right\}$ where $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. Determine whether W is a subspace of M_{22}.

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