Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S7: Fall 2022: **Quiz 11** 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. *(4 marks)* Given the points $A(1,2,-1)$ and $B(1,1,2)$. Find the point C on the y-axis such that the area of the triangle ABC is $\sqrt{10}/2$.

Question 2. *(5 marks)* Given the following lines which are all skew to each other:

$$\begin{aligned}
\mathscr{L}_1 &: (x,y,z) = (1,0,0) + t_1(1,2,0)\\
\mathscr{L}_2 &: (x,y,z) = (1,1,0) + t_2(1,0,1)\\
\mathscr{L}_3 &: (x,y,z) = (1,0,1) + t_3(1,2,3)
\end{aligned}$$

here t_1, t_2, $t_3 \in \mathbb{R}$. Consider a line $\mathscr{L}_4$ that is parallel to $\mathscr{L}_3$ and intersects both $\mathscr{L}_1$ and $\mathscr{L}_2$. Find the points of intersection of $\mathscr{L}_4$ with $\mathscr{L}_1$ and $\mathscr{L}_4$ with $\mathscr{L}_2$.

Question 3. *(3 marks)* Given $\mathscr{L}_1 : \mathbf{x} = (1,2,1) + t(2,-1,1),\ t \in \mathbb{R}$ and $\mathscr{L}_2 : \mathbf{x} = (3,3,3) + t(-4,2,-2),\ t \in \mathbb{R}$. Find the general equation of the plane that contains $\mathscr{L}_1$ and $\mathscr{L}_2$.

Question 4. If the statement is false provide a counterexample. If the statement is true provide a proof of the statement.

(3 marks) If $\vec{u}, \vec{v}$ and $\vec{w}$ are vectors in $\mathbb{R}^3$, where $\vec{u} \neq \vec{0}$ and $\vec{u} \times \vec{v} = \vec{u} \times \vec{w}$, then $\vec{v} = \vec{w}$.

Question Bonus. *(2 marks)* Discuss and give a correct analysis of the following

Let $R\{x \mid x \notin x\}$, then $R \in R \leftrightarrow R \notin R$