Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S1: Winter 2024: **Quiz 10** 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)* Given the plane $\mathscr{P} : 2x_1 - x_2 + 3x_3 = 5$, and the line $\mathscr{L} : \mathbf{x} = (3,0,4) + t(-1,1,1)$ where $t \in \mathbb{R}$, determine if the line is parallel to the plane, orthogonal to the plane, or neither parallel nor orthogonal. If possible find the intersection between $\mathscr{P}$ and $\mathscr{L}$, justify. Also if possible find the distance between $\mathscr{P}$ and $\mathscr{L}$, justify.

Question 2. *(5 marks)* Given that $\mathscr{L}_1 : \mathbf{x} = (1,0,2) + t(-1,3,2)$, $\mathscr{L}_2 : \mathbf{x} = (1,1,-1) + t(-1,3,2)$ where $t \in \mathbb{R}$ that lie on the same plane $\mathscr{P}$. Find the equation of the line $\mathscr{L}$ which lies on $\mathscr{P}$ and is equidistant from $\mathscr{L}_1$ and $\mathscr{L}_2$.

Bonus Question. *(3 marks)* Prove the Cauchy-Schwartz Inequality by using the squared norm of $||\vec{u}||\vec{v} - ||\vec{v}||\vec{u}$ and $||\vec{u}||\vec{v} + ||\vec{v}||\vec{u}$.