Dawson College: Fall 2019: Linear Algebra (SCIENCE): 201-NYC-05-S5: **Quiz 10** name: ________________

No books, watches, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. Given $\mathcal{P}_1 : 2x + y - 3z = 6$, $\mathcal{P}_2 : -6x - 3y + 9z = -18$, $\mathcal{P}_3 : x + y + z = 1$, $\mathcal{L}_1 : \vec{x} = (1, 0, 1) + t(-4, -2, 6)$, $\mathcal{L}_2 : \vec{x} = (1, 1, 1) + s(2, 1, -3)$, and $\mathcal{L}_3 : \vec{x} = (1, 1, 1) + r(-2, -1, 4)$ where $s, t, r \in \mathbb{R}$.

a. *(3 marks)* Determine whether $\mathcal{L}_1$ and $\mathcal{L}_2$ are skew lines.

b. *(3 marks)* Find the parametric equation of the plane that contains $\mathcal{L}_1$ and $\mathcal{L}_2$.

c. *(3 marks)* Find the intersection of $\mathcal{L}_2$ and $\mathcal{P}_1$. What of significance can be said about the point of intersection and the point $(1, 1, 1)$.

d. *(3 marks)* Find the intersection of $\mathcal{P}_1$, $\mathcal{P}_2$ and $\mathcal{P}_3$.

e. *(3 marks)* Find the smallest angle between $\mathcal{L}_3$ and $\mathcal{P}_3$.

f. *(3 marks)* Find the intersection of $2x + y - 3z = \alpha$, $-6x - 3y + 9z = \beta$, and $x + y + z = \gamma$ for fixed values of α, β, and γ given that intersection passes throught the point $(\pi, \sqrt{2}, e)$.

Question 2. *(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. The general solution of the nonhomogeneous linear system $A\mathbf{x} = \mathbf{b}$ can be obtained by adding $\mathbf{b}$ to the general solution of the homogeneous linear system $A\mathbf{x} = \mathbf{0}$.