Dawson College: Fall 2019: Linear Algebra (Science): 201-NYC-05-S5: **Quiz 11** name: ____________________

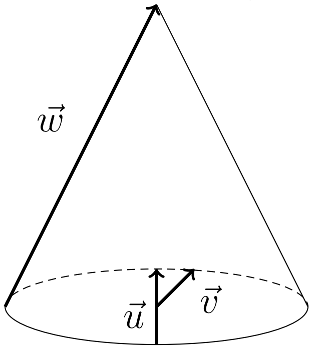
No books, watches, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. *(5 marks)* Given the following lines which are all skew to each other:

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

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

Question 2. *(5 marks)* Given the cone defined by the given vectors $\vec{u} = (2, 2, 4)$, $\vec{v} = (1, 2, 1)$ and $\vec{w} = (4, 1, 3)$. Find the volume of the cone. Note from the diagram that $\vec{w}$ is not perpendicular to the base, that $\vec{v}$ is positioned such that its tail is at the center of the circle and its tip lies on the circle, that $\vec{u}$ is positioned such that the vector passes through the center of the circle while its tail and tip lie on the circle. *(Hint: the volume of a cone is equal to one third of the area of the base times the height.)*



Question 3. *(4 marks)* Show that in 3-space the distance d from a point P to the line L through points A and B can be expressed as $d = \frac{||\vec{AP} \times \vec{AB}||}{||\vec{AB}||}$

Question 4. *(2 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. If $\vec{u}$, $\vec{v}$, and $\vec{w}$ are vectors in $\mathbb{R}^3$, where $\vec{u}$ is nonzero and $\vec{u} \times \vec{v} = \vec{u} \times \vec{w}$, then $\vec{v} = \vec{w}$.