Dawson College: **Linear Algebra and Vector Geometry**: 201-SN4-RE-S6: Winter 2026: **Quiz 7** name: ____________________

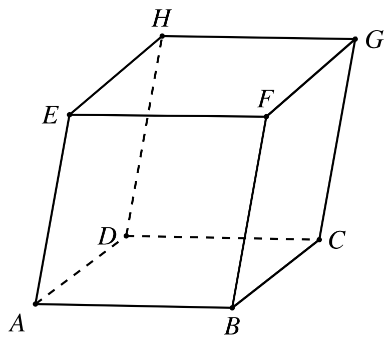
Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531**. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1.

a. *(2 marks)* State a formula for the area of the triangle in 2-space determined by the vectors $\mathbf{u} = (u_1,\ u_2)$ and $\mathbf{v} = (v_1,\ v_2)$.

b. *(2 marks)* State a formula for the area of the parallelogram in 3-space determined by the vertices A, B, C, and D.

c. *(3 marks)* State a formula for the volume of the parallelepiped described below.



Bonus. *(5 marks)* Precisely explain how to compute the 3-dimensional volume of a parallelepiped determined by three vectors in $\mathbb{R}^4$

Question 2. *(5 marks)* Let $\mathscr{L}_1 : (x,y,z) = (1,-2,3) + t(2,1,-1)$ where $t \in \mathbb{R}$ and let $\mathscr{L}_2$ be the line of intersection of the planes $x+2z=0$ and $y+z=1$. Find the shortest distance between $\mathscr{L}_1$ and $\mathscr{L}_2$.

Question 3. *(5 marks)* Find both the parametric and general equation of the plane containing the point $A(2,-1,4)$, parallel to the line $\mathscr{L}$: $(x,y,z)=(1,0,2)+t(2,1,0)$ where $t\in\mathbb{R}$ and perpendicular to the plane $\mathscr{P}:\ x-2y+2z=5$.

Question 4. *(5 marks)* Let $\mathscr{L}:\ (x,y,z)=(3,-1,2)+t(1,2,-1)$ where $t\in\mathbb{R}$ and let $\mathscr{P}$ be the plane passing through the points $A(1,0,1)$, $B(2,1,3)$, $C(0,2,2)$. Determine whether $\mathscr{L}$ intersects $\mathscr{P}$. If it does, find the point of intersection. If it does not, determine whether $\mathscr{L}$ is parallel to $\mathscr{P}$ or contained in $\mathscr{P}$.

Question 5. *(5 marks)* Let $A(4,-1,2)$ and let $\mathscr{P}$ be the plane containing the line $\mathscr{L}_1$ $(x,y,z)=(1,2,0)+s(1,-1,2)$ where $s\in\mathbb{R}$ and parallel to the line $\mathscr{L}_2$ $(x,y,z)=(0,1,3)+t(2,1,-1)$ where $t\in\mathbb{R}$. Find the point on $\mathscr{P}$ that is closest to A.