姓名: SOLUTION 葉均承 應數一線性代數

學號: _____ **Quiz 12** 考試日期: 2021/12/23

1. 請框出答案. 2. 不可使用手機、計算器，禁止作弊!
3. 作答完畢請拍照上傳 Googld Classroom
4. 照片請清晰並轉正

1. Determinant whether the given 4 points lie in a plane in $\mathbb{R}^3$. If so, find its area. If not, find its volume.

$$A(0,0,0), B(1,4,3), C(2,5,8), D(-1,2,-4)$$

Answer: ✗ $ABCD$ are coplanar, and the area is _____.

✓ $ABCD$ are NOT coplanar, and the volume is 1.5.

$\overrightarrow{AB} = [1,4,3], \overrightarrow{AC} = [2,5,8], \overrightarrow{AD} = [-1,2,-4]$

$$\begin{vmatrix} 1 & 4 & 3 \\ 2 & 5 & 8 \\ -1 & 2 & -4 \end{vmatrix} = -9 \neq 0$$

So the points are not coplanar and the volume of the Parallelepiped (平行六面體) formed by coterminous (相鄰邊) edges $\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD}$ is 9.

The volume of a tetrahedron (四面體) $ABCD$ formed by coterminous (相鄰邊) edges $\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD}$ is

$$\frac{\text{volume of the Parallelepiped}}{6} = \frac{9}{6} = 1.5$$