姓名: SOLUTION 葉均承 應數一線性代數

學號: _____ **Quiz 9** 考試日期: 2020/12/10

1. 請框出答案. 2. 不可使用手機、計算器，禁止作弊! 3. 背面還有題目

1. Determinant whether the given 4 points lie in a plane in $\mathbb{R}^3$

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

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

$$\begin{vmatrix} 1 & 4 & 3 \\ 2 & 5 & 8 \\ -1 & 2 & -5 \end{vmatrix} = -6 \neq 0$$

So the points are not coplanar.

2. Let $T : P_3 \to P_3$ be defined by $T(p(x)) = \frac{d}{dx}p(x)$, the ordered basis for $P_3$ is $(x^3, x^2, x, 1)$. Fine the standard matrix representation of $T$.

$$T(x^3) = 0x^3 + 3x^2 + 0x + 0$$
$$T(x^2) = 0x^3 + 0x^2 + 2x + 0$$
$$T(x^1) = 0x^3 + 0x^2 + 0x + 1$$
$$T(1) = 0x^3 + 0x^2 + 0x + 0$$

Hence the standard matrix representation A is

$$A = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 3 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$