姓名: SOLUTION 葉均承 應數一線性代數

學號: ________________ **Quiz 2** 考試日期: 2020/10/08

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. (50%) Determine whether the given subset is a subspace of $\mathbb{R}^3$. Please give reasons to support your answer.

$$\{[2x, x+y, y] | x, y \in \mathbb{R}\}$$

Circle the answer: ($\boxed{Yes}$ / NO), and write your reason below.

solution 1:
For any $\vec{v}, \vec{u} \in W$, $r \in R$. Let $\vec{v} = [2x, x+y, y], \vec{u} = [2p, p+q, q]$.
(1) $\vec{v} + \vec{u} = [2x, x+y, y] + [2p, p+q, q] = [2(x+p), (x+p) + (y+q), (y+q)] \in W$
(2) $r\vec{v} = r[2x, x+y, y] = [2(rx), (rx) + (ry), ry] \in W$
Hence W is a subspace of $\mathbb{R}^n$

solution 2:
For any $\vec{v}, \vec{u} \in W$, any $r, s \in R$. Let $\vec{v} = [2x, x+y, y], \vec{u} = [2p, p+q, q]$.
$r\vec{v} + s\vec{u} = r[2x, x+y, y] + s[2p, p+q, q] = [2(rx+sp), (rx+sp) + (ry+sq), ry+sq] \in W$.
Hence W is a subspace of $\mathbb{R}^n$

2. (50%) (a) Find the inverse of the matrix A, if it exists, and (b) express the inverse matrix as a product of elementary matrices. $A = \begin{bmatrix} 3 & 6 \\ 3 & 8 \end{bmatrix}$

Answer: (a) $A^{-1} = \begin{bmatrix} 1.\bar{3} & -1 \\ -0.5 & 0.5 \end{bmatrix}$, (b) $A^{-1} = \begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 0.5 \end{bmatrix} \begin{bmatrix} 1/3 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$