姓名: SOLUTION 葉均承 應數一線性代數

學號: ________________ **Quiz 2** 考試日期: 2023/09/27

1. 請框出答案. 2. 不可使用手機、計算器，禁止作弊!

1. Prove that the given relation holds for all real matrices A and B if the expression is defined.

$$(AB)^T = B^T A^T$$

Solution：

1-3 #32 (上課有證)，或是 109-1 quiz 1 也有證。

2. Determine whether the vector $\vec{b}$ is in the span of the vectors $\vec{v_i}$. If so, write $\vec{b}$ into the linear combination form.

   p.s. Please solve the problem with the corresponding augmented matrix. Also mark the row-echlon form and reduced row-echlon form of the augmented matrix.

   Answer: $\vec{b} =$ **35** $\cdot\vec{v_1} +$ **-14** $\cdot\vec{v_2} +$ **0** $\cdot\vec{v_3}$

$$\vec{b} = \begin{bmatrix} 14 \\ 28 \\ 7 \end{bmatrix}, \vec{v_1} = \begin{bmatrix} 2 \\ 4 \\ -1 \end{bmatrix}, \vec{v_2} = \begin{bmatrix} 4 \\ 8 \\ -3 \end{bmatrix}, \vec{v_3} = \begin{bmatrix} -2 \\ 3 \\ 0 \end{bmatrix}$$

Solution：

augmented matrix: $\begin{bmatrix} 2 & 4 & -2 & 14 \\ 4 & 8 & 3 & 28 \\ -1 & -3 & 0 & 7 \end{bmatrix}$, reduced row-echlon form: $\begin{bmatrix} 1 & 0 & 0 & 35 \\ 0 & 1 & 0 & -14 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

Yes! the vector $\vec{b}$ is in the span of the vectors $\vec{v_i}$.

$$\vec{b} = 35 \cdot \vec{v_1} - 14 \cdot \vec{v_2} + 0 \cdot \vec{v_3}$$

```
octave:1> b=[14;28;7];
octave:2> v1=[2;4;-1];
octave:3> v2=[4;8;-3];
octave:4> v3=[-2;3;0];
octave:5> A=[v1 v2 v3 b]

A =

          2           4          -2          14
          4           8           3          28
         -1          -3           0           7

octave:6> rref(A)
ans =

          1           0           0          35
          0           1           0         -14
          0           0           1           0
```