姓名: SOLUTION　　葉均承　　應數一線性代數

學號: _____　　**Quiz 3**　　考試日期: 2024/10/02

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，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** $\cdot\vec{v_3}$

$$\vec{b} = \begin{bmatrix} 3 \\ 0 \\ 3 \end{bmatrix}, \vec{v_1} = \begin{bmatrix} 0 \\ -1 \\ 1 \end{bmatrix}, \vec{v_2} = \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}, \vec{v_3} = \begin{bmatrix} -1 \\ 2 \\ -3 \end{bmatrix}$$

Solution :

augmented matrix: $\begin{bmatrix} 0 & 2 & -1 & 3 \\ -1 & 1 & 2 & 0 \\ 1 & 1 & -3 & 3 \end{bmatrix}$, reduced row-echlon form: $\begin{bmatrix} 1 & 0 & -2.5 & 1.5 \\ 0 & 1 & -0.5 & 1.5 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

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

$$\vec{b} = 1.5 \cdot \vec{v_1} 1.5 \cdot \vec{v_2} + 0 \cdot \vec{v_3}$$

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octave:1> A=[0 2 -1 3;-1 1 2 0;1 1 -3 3]

A =

   0   2  -1   3
  -1   1   2   0
   1   1  -3   3

octave:2> rref(A)
ans =

   1.0000        0  -2.5000   1.5000
        0   1.0000  -0.5000   1.5000
        0        0        0        0
```