姓名: SOLUTION 葉均承 應數一線性代數

學號: ________________ **Quiz 5** 考試日期: 2020/04/01

1. 請框出答案. 2. 不可使用手機、計算器，禁止作弊!

1. Using the Gram-Schmidt process to find an orthonormal basis for the subspace of $\mathbb{R}^4$ spanned by $[1,0,1,0], [1,1,1,0], [1,-1,0,1]$.

   Answer: $\frac{1}{\sqrt{2}}[1,0,1,0], [0,1,0,0], \frac{1}{\sqrt{6}}[1,0,-1,2]$

$$\vec{a_1} = [1,0,1,0], \vec{a_2} = [1,1,1,0], \vec{a_3} = [1,-1,0,1],$$

$$\vec{v_1} = [1,0,1,0], \vec{q_1} = \frac{\vec{v_1}}{\|\vec{v_1}\|} = \frac{1}{\sqrt{2}}[1,0,1,0],$$

$$\vec{v_2} = \vec{a_2} - \frac{\vec{a_2}\cdot\vec{v_1}}{\vec{v_1}\cdot\vec{v_1}}\vec{v_1} = [0,1,0,0], \vec{q_2} = \frac{\vec{v_2}}{\|\vec{v_2}\|} = [0,1,0,0],$$

$$\vec{v_3} = \vec{a_3} - \frac{\vec{a_3}\cdot\vec{v_1}}{\vec{v_1}\cdot\vec{v_1}}\vec{v_1} - \frac{\vec{a_3}\cdot\vec{v_2}}{\vec{v_2}\cdot\vec{v_2}}\vec{v_2} = [0.5,0,-0.5,1], \vec{q_3} = \frac{\vec{v_3}}{\|\vec{v_3}\|} = \frac{1}{\sqrt{6}}[1,0,-1,2],$$