1.12 Pop quiz on Lecture 12 material

1. Carefully state the definition of a linear transformation.
2. Carefully state the definition of a subspace.
3. Carefully state the defintion of a linear combinatation.
4. Carefully state the definition of a linearly independent.
5. Carefully state the definition of $\text{span}\{v_1, \ldots, v_k\}$.
6. Let V be a vector space. Carefully state the definition of $\dim(V)$.
7. Give three favourite examples of vector spaces.
8. Let $v_1, v_2, v_3, v_4 \in \mathbb{R}^3$ be given by

$$v_1 = |1, 2, 3\rangle, \quad v_2 = |3, 6, 9\rangle, \quad v_3 = |-1, 0, -2\rangle, \quad v_4 = |1, 4, 4\rangle.$$

   (a) Is $\{v_1, v_2, v_3, v_4\}$ linearly independent?
   (b) Express v_2 and v_4 as linear combinations of v_1 and v_3.
   (c) Is $\{v_1, v_3\}$ linearly independent?

9. Determine (with proof) whether the line $L = \{|x, y\rangle \in \mathbb{R}^2 \mid y = 2x + 1\}$ is a subspace of $\mathbb{R}^2$.
10. Determine (with proof) whether the line $L = \{|x, y\rangle \in \mathbb{R}^2 \mid y = 2x\}$ is a subspace of $\mathbb{R}^2$.