Reading Assignment 2

Read Sect. 1.3 and Sect. 1.4

All the notation in these questions can be found in Sect. 1.3 and 1.4. Usually $S$ denotes a subset of a vector space and $V$ denotes a vector space. I am putting arrows on top of the vectors to differentiate from scalars. I think it will help you to differentiate them at first, until you become used to thinking in terms of vectors. Your book uses $u$’s and $v$’s for vectors and $a$’s and $b$’s for scalars.

1. State two ways to prove that a subset of a vector space is a subspace. (Sect. 1.3)

2. What is the definition of symmetric matrix. Give a numerical example of a $3 \times 3$ symmetric matrix (Sect. 1.3)

3. What are the examples of subspaces of $M_{n \times n}(F)$ given in Sect. 1.3, don’t forget to look in the exercises.

4. What is the smallest subspace that can be the intersection of two subspaces of a vector space? For instance, can the intersection be empty? (Sect. 1.3)

5. Let $S = \{(1, 0, 0), (1, 1, 0)\}$ and $\vec{v} = (3, 1, 0)$. Is $\vec{v}$ a linear combination of elements in $S$? Can you think of a vector in $\mathbb{R}^3$ that is not a linear combination of the elements in $S$. (Sect. 1.4)

6. What do you have to find to show that a vector $\vec{v}$ is a linear combination of $\vec{u}_1, \vec{u}_2, \ldots, \vec{u}_n$? (Sect. 1.4)

7. Give an example of a linear system of equation with 2 equations and 3 unknowns? What are the three operations given in Section 1.4 used to solve linear systems of equations? (Sect. 1.4)

8. Give an example of a linear system of equations that satisfies the three conditions at the bottom of page 27. (Sect. 1.4)
9. Give two examples of vectors in span(S) where $S = \{(1, -1, 0), (0, 1, 2)\}$. (Sect. 1.4)

10. Is span(S) a subspace? Why or why not? (Sect. 1.4)

11. What does $S$ spans $V$ mean? Can you find a set that spans $\mathbb{R}^3$ different from the example in Example 3 in Sect. 1.4?

12. Find an equivalent way to say the $\vec{x}$ is in the plane containing $\vec{u}$ and $\vec{v}$.

**Practice Problems**

Sect. 1.3 # 1 (justify your answers), 2, 5, 8, 12 (what about lower triangular?).

Sect. 1.4 # 1 (justify your answers), 2, 3, 4, 5.