

# Vector Subspaces (HW #2)

A **vector subspace** is a set of vectors that is closed under vector addition (CUVA) and closed under scalar multiplication (CUSM).

A vector subspace must be a set of vectors. So far we have only used column vectors from  $\mathbb{R}^n$ , but there are other vector spaces. Any set meeting the conditions 1-8 found on page 131 (5th edition) is a vector space. The most famous vector spaces that we will be using are:  $\mathbb{R}^n$ ;  $\mathbb{C}^n$ , the set of column vectors with complex entries;  $M_{m \times n}$ , the set of all  $m \times n$  matrices; and  $\mathcal{F}$ , the set of real valued functions with one input.

Which of the following are vector subspaces? Defend your answer.

- 1) The span of any set of vectors.

2)  $C(A)$  = span of the columns of  $A$ ; this is the column space of  $A$ .  $C(A^T)$  is the row space of  $A$ .

3)  $V = \{(x, y, y) | x, y \in \mathbb{R}\}$

4)  $V = \{(x, y, 3) | x, y \in \mathbb{R}\}$

5)  $V = \{(x, y) | x, y \in \mathbb{Z}\}$

6)  $V$  is the set of all odd real valued functions.