THEOREM

Let V and W both be subspaces of the vector space U. Then $V \cap W$ (the intersection of V and W) is also a subspace of U.

SPANNING SETS & LINEAR INDEPENDENCE

Section 4.4

SPANNING SETS

Let $S = \{\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_k\}$ be a subset of vector space V. S is called a **spanning set** of V if *every* vector in V can be written as a linear combination of the vectors in S. In this case, we say that S **spans** V.

TERMINOLOGY

Let $\mathbf{v}_i \in \mathbb{R}^n$; $\operatorname{span}\{\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_k\}$ is called the **subset of** $\mathbb{R}^n$ **spanned by (or generated by)** $\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_k$.

EQUIVALENT QUESTIONS

1. Is $\mathbf{b} \in \text{span}\{\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_k\}$?
2. Can $\mathbf{b}$ be written as a linear combination of the $\mathbf{v}_i$'s?
3. Can the $\mathbf{v}_i$'s "generate" $\mathbf{b}$?
4. Does $\left[\mathbf{v}_1\ \mathbf{v}_2 \cdots \mathbf{v}_k \,\middle|\, \mathbf{b}\right]$ have a solution?