Due Monday, Sept. 14 at the beginning of lecture.

1. Section 1.5, Exercise 3.

2. Let $S$ be the subset
   $$\{\sin^2(x), \sin(2x), \cos(2x), 1\}$$
   of the vector space $\mathcal{F}(\mathbb{R}, \mathbb{R})$. Which subsets of $S$ are linearly dependent and which are linearly independent?

3. Prove that if $S = \{v_1, \ldots, v_n\}$ is a finite, linearly independent set of vectors in a vector space $V$, then every vector $w \in \text{Span}(S)$ has a unique expression as a linear combination
   $$a_1v_1 + \cdots + a_nv_n.$$  

4. Find a basis of the subspace of symmetric matrices in $M_{3 \times 3}(\mathbb{R})$. What is the dimension of this subspace?

5. Prove that if $V$ is a vector space over $\mathbb{F}_2$ with finite dimension $n$, then $V$ is a finite set. How many elements does it have?