1. Apostol §3.10, p. 103, Exercise # 24deh

2. Let $V$ denote the linear space consisting of all polynomials whose third derivative is zero. What is the dimension of $V$?

3. Determine whether or not the set

$$S = \{(1,1,0,0,0), (-1,1,1,0,0), (0,4,2,0,0)\}$$

of vectors in $\mathbb{R}^5$ is linearly independent. What is dimension of the linear span of $S$?

4. Find a basis for the subspace $W$ of $\mathbb{R}^4$ spanned by the vectors

$$(1,1,2,4), (2,-1,-5,2) (1,-1,-4,0) (2,1,1,6),$$

and determine the dimension of $W$.

5. Find a basis for the nullspace of the matrix

$$A = \begin{bmatrix}
1 & 2 & 1 & -3 \\
2 & 4 & 4 & -1 \\
3 & 6 & 7 & 1
\end{bmatrix}$$

6. Find the dimension and a basis for the subspace of $\mathbb{R}^5$ consisting of all solutions to the following system of homogeneous linear equations:

$$x + 2y - 4z + 3u - v = 0$$
$$x + 2y - 2z + 2u + v = 0$$
$$2x + 4y - 2z + 3u + 4v = 0$$

7. Find the coordinates of the vector $v = (3,1,-4) \in \mathbb{R}^3$ relative to the ordered basis $w_1 = (1,1,1), w_2 = (0,1,1), w_3 = (0,0,1)$ of $\mathbb{R}^3$. 
8. Let $P_2$ be the linear space of all polynomials of degree at most 2.
   (a) Is $t^2 - 1$ in the subspace of $P_2$ spanned by \{1 + t, 1 - t, t^2 + 2\}? 
   (b) Show that the polynomials $f_1 = 1, f_2 = t - 1, f_3 = (t - 1)^2$ form a basis for $P_2$.
   (c) Find the coordinates of $2t^2 - 5t + 6$ relative to the ordered basis $(f_1, f_2, f_3)$ for $P_2$.

9. Let $V$ be a finite-dimensional linear space. It follows from Theorem 3.5 in Apostol that $\dim(V)$ is the maximum number of linearly independent vectors in $V$. Prove that $\dim(V)$ is also the minimum number of vectors which span $V$.

10. Apostol §3.13, p. 109, Exercise # 6

11. Apostol §3.13, p. 110, Exercise # 12

12. Apostol §3.13, p. 110, Exercise # 14ac