Study guide

- (§3.1) Understand the notion of a "vector space" intuitively. For this course, you do not need to know or work with the formal axioms.
- (§3.1) Know the notation for the four main vector spaces we work with: $\mathbb{R}^n, \mathcal{P}_d, \mathcal{C}[a,b], M_{m\times n}$ (note: my notation $\mathcal{C}[a,b]$ from class is slightly different from the book's notation; you can feel free to use whichever you like).
- (§3.2) Know the definition of a subspace, and how to formally prove that something is a subspace of a vector space V.
- (§3.2) Know what subsapces of $\mathbb{R}^3$ look like geometrically.
- (§3.3) Know the definition of a basis. Understand why both parts (spanning, and linear independence) are included.
- (§3.3) Be able to determine whether a given subset of a specific vector space is a basis.
- (§3.3) Be able to find the basis of a subspace defined by several free variables (e.g. problem 3.3.20).
- (§3.3) Be able to find a basis for a span of a set of vectors in $\mathbb{R}^n$ (e.g. problem 3.3.26).

Textbook problems

- §3.2: 18, 20, 26, 30, 44, 50
- §3.3: 12, 20, 26, 38

Supplemental problems:

1. Suppose that A is an $n \times n$ matrix. Let $W \subseteq M_{n\times n}$ denote the set of matrices B such that $AB = BA$ (that is, A and B commute).
   (a) Show that W is a *subspace* of $M_{2\times 2}$.
   (b) Suppose that A is not a scalar multiple of the identity matrix. Prove that W is at least 2-dimensional (Hint: show that it contains the span of $\{A, I\}$).