Math 4326 | **LINEAR ALGEBRA** | Spring 2017

Dr. Duval | **Homework**

Tuesday, January 31

Follow the separate general guidelines for Parts A,B,C. Be sure to include and label *all four* standard parts (a), (b), (c), (d) of Part A in what you hand in.

Dimension
Section 2.C

A: Reading questions. Due by 2pm, Mon., 6 Feb.

1. What is the significance of result 2.35 (Basis length ...)? Why must it be the first result of this section? [Hint: What is the name of this section?]
2. Find the definition of "finite-dimensional" vector space in the text. [Hint: Believe it or not, it is **not** in this section!] How does it compare to the definition of "dimension" in this section? Why are these two definitions compatible?
3. Which do you think will prove to be more useful, Proposition result 2.39 (Linearly independent list ...), or result 2.42 (Spanning list ...)? Why?
4. Which parts of Example 2.41 would not work if we replaced $(x-5)^2$ by $(x-5)$, and why?
5. Verify that result 2.43 (Dimension of a sum) works when U_1 is the xy-plane, and U_2 is the yz-plane, in $\mathbf{R}^3$.

B: Warmup exercises. For you to present in class. Due by end of class Tue., 7 Feb.

Exercises 2.C: 1, 4, 11

The Vector Space of Linear Maps
Section 3.A

A: Reading questions. Due by 2pm, Wed., 8 Feb.

1. Verify the following functions, described on pp. 52–53, are in fact linear maps: identity, differentiation, multiplication by x^2, backward shift.
2. Let's illustrate one part of result 3.5 (Linear maps and basis ...), namely the need for $v_1, \ldots, v_n$ to be a basis, with an example. First, explain why $(1,0,1), (0,1,1), (1,1,2)$ is **not** a basis of $\mathbf{F}^3$. Then show that there is **no** linear map $T\colon \mathbf{F}^3 \to \mathbf{F}^4$ such that $T((1,0,1)) = (2,0,1,7), T((0,1,1)) = (1,9,6,6), T((1,1,2) = (3,9,6,12)$.
3. Verify that $S+T$ is a linear map from V to W whenever $S, T \in \mathcal{L}(V,W)$.
4. Verify the first distributive property on p. 56: $(S_1+S_2)T = S_1T + S_2T$ whenever $T \in \mathcal{L}(U,V)$ and $S_1, S_2 \in \mathcal{L}(V,W)$.

B: Warmup exercises. For you to present in class. Due by the end of class Thu., 9 Feb.

Exercises 3.A: 1, 5, 8