Math 4326 **LINEAR ALGEBRA** Spring 2008
Dr. Duval **Homework**
Thursday, 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.

Definitions and Examples

pp. 38–41

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

1. Verify the following functions, described on pp. 38–39, are in fact linear maps: identity, differentiation, multiplication by x^2, backward shift.
2. Near the top of p. 40, the text claims of a certain equation: "Because $(v_1, \ldots, v_n)$ is a basis of V, the equation above does indeed define a function T from V to W." Provide the missing details of this claim.
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. 41: $(S_1 + S_2)T = S_1T + S_2T$ 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 end of class Thu., 7 Feb.

Ch. 3: Exercises 1, 2

Null Spaces and Ranges (part I)

pp. 41–44

A: Reading questions. Due by 2pm, Mon., 11 Feb.

1. Find the null space of the identity map, defined on p. 38. Is this map injective? Why or why not?
2. Find the range of the backward shift map, defined on p. 39. Verify this map is surjective, as claimed on p. 44.
3. Identify, as precisely as you can, when we **use** the linearity of T in the proofs of Propositions 3.1, 3.2, and 3.3. [Pinpoint the exact equations and statements that depend on linearity, and which part of the definition of linearity that is used in each case.]
4. Does surjectivity of a map $T \in \mathcal{L}(V, W)$ depend on V, W, both, or neither? If it does depend on V and/or W, give an example showing how changing V and/or W changes the surjectivity of T.

B: Warmup exercises. For you to present in class. Due by end of class Tue., 12 Feb.

Ch. 3: Exercises 5, 6