Math 4326   **LINEAR ALGEBRA**   Spring 2008
Dr. Duval   **Homework**
Thursday, March 20

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.

Norms
pp. 102–106

A: Reading questions. Due by 2pm, Wed., 2 Apr.

1. Provide justification for each step in the derivations, on p. 102 and p. 105, respectively, that $\|av\| = |a|\|v\|$, and $\|u + v\| \le \|u\| + \|v\|$. Note that some of these will be properties of inner products, and others will be properties of complex conjugates (see p. 69).

2. Verify the claim, below equation 6.5, that if $v \ne 0$, this equation writes u as a scalar multiple of v plus a vector orthogonal to v.

3. Directly verify the Cauchy-Schwarz inequality (6.6) for the following pairs of vectors:

   - $(3, 1, 4)$ and $(2, 7, 1)$ in $\mathbf{R}^3$, with inner product 6.1; and
   - x^2 and $7x - 2$ in $\mathcal{P}_2(\mathbf{R})$, with inner product 6.2.

B: Warmup exercises. For you to present in class. Due by end of class Thu., 3 Apr.

     Justify the steps 6.14.

     Ch. 6: Exercise 4.

Orthonormal Bases
pp. 106–110

We will only be considering material in this section up to and including the proof of Corollary 6.25.

A: Reading questions. Due by 2pm, Mon., 7 Apr.

1. Verify the list of four vectors in $\mathbf{R}^4$ given in the middle of p. 107 is indeed orthonormal.

2. Demonstrate Theorem 6.17 with $V = \mathbf{R}^4$, orthonormal basis (e_1, e_2, e_3, e_4) given by the list in question 1 above, and $v = (4, 3, 2, 6)$.

3. Try to read the proof of the Gram-Schmidt theorem (6.20) without worrying too much about the precise algebraic details of equation 6.23 or the calculation at the top of p. 109. The third sentence of the proof says, "We will choose $e_2, \ldots, e_m$ inductively...". What, in your own words, does that mean in this case?

4. Near the top of p. 108, the text asks, "does $\mathcal{P}_m(\mathbf{F})$, with inner product [given by 6.2] have an orthonormal basis?" Answer this question, and explain your answer. [Note: you do **not** have to produce such a basis, just decide whether or not it exists.]

B: Warmup exercises. For you to present in class. Due by end of class Tue., 8 Apr.

     Ch. 6: 10.