Math 3592H Honors Mathematics I Fall Semester 2010

Assignment 10 - Due Thursday 11/18/2010

Read: Hubbard and Hubbard Section 2.4 and 2.5. I am not sure how far we will get with 2.5 and we may not finish it.

Exercises:
Hand in only the exercises which have stars by them.

Section 2.4 (pages 193-194): 2, 2b*, 4*, 7, 8*, 10, 12*
Section 2.5 (pages 207-211): 1, 2, 3, 4, 6, 6b*, 7.

Extra questions:
1. Construct a matrix with no zero entries whose echelon form is

$$\begin{pmatrix} 1 & 2 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}.$$

2. Extend each of the following lists of vectors to a basis of the whole space (I write row vectors instead of column vectors because they fit on lines better):
(i) (1,1,1). (ii) (1,2,3), (0,2,3). (iii)* (1,2,3,4), (1,1,1,1), (0,0,1,2).

3. Consider the vectors (1,2,3), (3,2,1), (1,0,–1), (–1,2,5).
(i) Find a subset of these vectors which is a basis for the space which they span, and which contains the first vector.
(ii)* Find a subset of these vectors which is a basis for the space which they span, and which contains the last vector.

4*. Let U be the subspace of 4-dimensional space which consists of the vectors (w,x,y,z) for which $w + x + y + z = 0$. Extend the vector $(1, -1, 1, -1)$ to a basis of U.

5*. Let U and V be linear subspaces of 10-dimensional real space. Suppose that U is a subset of V and that $\dim U = \dim V = 5$. Prove that $U = V$.

Comments on some exercises:
Some of the exercises in Section 2.4 seem too easy, like questions 3, 5 and 6 for example, and I have left them out of the recommended list. Others seem to require the reader to understand some very specific things which do not seem to me to be that instructive. I include question 11 from Section 2.4 in this category. Have a look, and form your own opinion.

... and some more comments:
In the exam on November 11 the material will be taken from Sections 1.5 - 1.10, starting in Section 1.5 at page 89 where limits, continuity etc. of sequences of vectors and vector-valued functions are introduced, plus the extra questions on the assignment sheets. You may not use books or notes on the exam, but you may use a calculator.

There is a question on the exam in which you are asked to choose between a pair of statements (both are true statements) and prove one of them. If you can answer questions like 1.7.14 (on page 139) or 1.6.7 (on page 119) adequately you should be able to do this question. The difficulty may be that you do not have much experience answering this kind of question.