Assignment #3

Due Wednesday 13 February, 2013 at the start of class

Please read Lectures 2, 3, 4, and 5 in the textbook *Numerical Linear Algebra* by Trefethen and Bau. Do these exercises:

P7. **(a)** On page 12 of the textbook, equation (2.4) says $(AB)^* = B^*A^*$. Prove this.

(b) In the last sentence on page 12, the textbook claims $(A^{-1})^* = (A^*)^{-1}$. Prove this.

P8. On page 21 of the textbook, equation (3.10) gives a formula for the ∞-norm of an $m \times n$ matrix. Prove this:

$$\|A\|_\infty = \max_{1 \le i \le m} \|a_i^*\|_1.$$

Exercise 2.5 in Lecture 2. (*In my copy of the textbook there is a typo in part (a). It should say "Show by using Exercise 2.3 that . . . ".*)

Exercise 2.6 in Lecture 2.

Exercise 3.2 in Lecture 3.

Exercise 3.3 in Lecture 3. Do parts (a) and (b) only.

Exercise 4.3 in Lecture 4. Use the built-in "`svd`" command. For instance, these commands will find v_1, v_2 and u_1, u_2:

```
[U, S, V] = svd(A);
v1 = V(:,1);
v2 = V(:,2);
u1 = U(:,1);
u2 = U(:,2);
```

Also: (i) Your code should be a function with a first line like "`function showmat(A)`." (ii) Use `subplot(1,2,1)` for the left part of the figure and `subplot(1,2,2)` for the right part. (iii) One point extra credit for making it look really clean like Figure 4.1. (*Thus my intent in this problem is to ask you to write some* MATLAB *plotting code, as an early step to understanding the SVD. You do not need to* understand *the SVD very well to do this problem.*)