CS 525 - Fall 2011 - Homework 2*

assigned 9/14/11 - due 9/21/11

Hand in an annotated diary file, constructed as outlined in the MATLAB Setup handout and in Homework 1. Your diary should contain a record of your session and should look something like the following:

```
≫ diary hwk2.lastname.firstname
≫ G=[1 2 -1 3; 2 1 3 5; 0 -3 4 -2];
≫ ...
≫ who
≫ ...
≫ ...
≫ diary off
```

Be sure to write out the solution explicitly. For example, if you are asked for B^{-1}, extract this matrix from the tableau, perform any necessary row and column permutations, and annotate your file clearly to indicate this matrix.

1. Let
$$G = \begin{bmatrix} 3 & -1 & 2 & -3 & -2 \\ -5 & 3 & -1 & -3 & 0 \\ 2 & 0 & -2 & 2 & -3 \end{bmatrix}.$$
By using the Jordan exchange code `ljx.m`, find out how many linearly independent rows G has. Find out how many linearly independent columns G has. (You can do the latter by working with G'.) In both cases, if there are linear dependencies, write them out explicitly.

*Hard copy to be submitted **in class** on the due date. No late homework accepted.

2. Consider the following two matrices:

$$E = \begin{bmatrix} 8 & 2 & -1 \\ -4 & 0 & 0 \\ 9 & 2 & 4 \end{bmatrix}, \quad F = \begin{bmatrix} 3 & 1 & 1 & 1 \\ 3 & 3 & -1 & 1 \\ 1 & 1 & 1 & 3 \\ -2 & 2 & -2 & 2 \end{bmatrix}.$$

   Use `ljx.m` to find the inverse of each matrix, if it exists. If the matrix is singular, show the linear dependence between the rows.

3. Do Exercise 2-4-6. (The data for this problem can be loaded using `load ex2-4-6`.)

4. Do Exercise 2-3-5 by hand.

5. Do Exercise 2-4-8. (Make up a *small* matrix A with the required properties in each case, and explain why it has those properties, and also give examples of b where necessary.)

6. Prove that the product AB of two square matrices is nonsingular if and only if both A and B are non-singular. Remember, that if and only if means you have to prove this both ways: if AB is invertible then show A and B must both be invertible. If A and B are invertible, how AB is invertible.