

# CS 525 - Fall 2009 - Homework 2\*

assigned 9/10/09 - due 9/18/09

Hand in an annotated diary file, constructed as outlined in the MATLAB Setup handout. Your diary should contain a record of your session and should look something like the following (but without the first line):

```
>> diary hwk2.lastname.firstname
>> G=[1 2 -1 3; 2 1 2 5; 0 -3 4 -2];
>> ...
>> load ex2-3-4
>> 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. Reformulate the following optimization problems as linear programs in standard form, that is, all variables are nonnegative variables and all general constraints are  $\geq$  constraints.

(a)  $\max p^T x$  subject to  $Ax = b$ ,  $Cx \leq d$ ,

(b)  $\min \|Ax - b\|_1$  subject to  $x \geq 0$ .

(Here  $A$  and  $C$  represent matrices while  $p$ ,  $b$ , and  $d$  represent vectors of appropriate dimension.)

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\*Hard copy to be submitted **in class** on the due date. (No need to submit to the Dropbox on learnUW.) No late homework accepted.

2. Let

$$G = \begin{bmatrix} 1 & 2 & -1 & 3 \\ 2 & 1 & 2 & 5 \\ 0 & -3 & 4 & -2 \end{bmatrix}.$$

By using the Jordan exchange code `1jx.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.

3. Do Exercise 2-3-5 (by hand).

4. Do Exercise 2-3-4. (If you have set up your Matlab path properly and downloaded the zip file containing the course software to your local environment if necessary, data for this problem can be loaded by typing `load ex2-3-4`. Otherwise you can type it yourself.)