

CS 525 - Fall 2015 - Homework 1 *

assigned 9/2/15 — due 9/9/15

Refer to the *MATLAB Primer* and other documentation for MATLAB, linked to from the class web site, for information about how to use these MATLAB commands.

The data for this problem, namely

$$A = \begin{bmatrix} -1 & 2 & -3 \\ 0 & 4 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 3 & 5 \\ 4 & 1 & 8 \\ 1 & 1 & 1 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 1 & -3 \\ 1 & 0 & 1 \end{bmatrix},$$

$$x = \begin{bmatrix} 1 \\ 3 \\ 4 \\ 0 \\ -2 \\ 6 \end{bmatrix}, \quad y = \begin{bmatrix} 1 \\ 2 \\ 1 \\ 5 \\ 2 \\ 3 \end{bmatrix}, \quad z = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \quad \alpha = 3,$$

can be loaded within MATLAB from `hwk1.mat` by issuing the `load hwk1` command as indicated below in the description of the diary file.

Write a MATLAB m-file called `hw1run.m` to carry out the following operations. Make your answers as concise as possible. Suggestions for the MATLAB commands you should use are given `help` statements.

1. Clear the workspace of all variables (`help clear`).
2. Load the data from `hwk1.mat` and then print out a list of all variables currently in scope (`help who`).
3. Calculate $F = AB$ without printing the result.
4. Calculate and print $A - 2\alpha C$.
5. Print F .

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

6. Calculate v , where $v_i = 2x_i/y_i$, outputting the solution immediately.
7. Change the 5th component of x to -8 , without printing the result.
8. Calculate and print $w = (x_6, x_2, x_4, x_1, x_3, x_5)$ (a row vector).
9. Calculate and print $\min_{i=1,2,\dots,6} x_i$ (**help min**).
10. Calculate and print $D = C'A + 2B$.
11. Calculate the LU decomposition of D (**help lu**). Check that $D = LU$ holds to within high accuracy by calculating and printing the element of largest absolute value in $D-LU$ (**help max**, **help abs**). (Be careful! If X is a matrix, **max(X)** returns a row vector whose i th element is the maximum element in column i of X . This is not quite what you want.)
12. Extract the diagonal of the matrix U into a vector d (**help diag**)
13. Sum up the elements of d and prints the result with 15 figures of accuracy (**help format**).

Create a diary file called `hwk1.lst` that lists the contents of `hw1run.m` and lists its output. You can do this by typing the following lines into your MATLAB session:

```
>> diary hwk1.lst
>> echo on;
>> %hwk1.yourlastname.yourinitial
>> type hw1run.m;
>> hw1run
>> %end hwk1
>> diary off
```

The “echo on” comment ensures that commands are printed as they are executed.

CVX. Download and install `cvx` from `cvxr.com` on the computer that you are using for Matlab. Write a program to solve Example 3-1-1 from class using CVX. (The CVX home page gives a very simple example that you can use as a template.) Have your code print out the solution once you have exited from the `cvx` environment. Save all output in a diary file.