

MATH 240- Spring 2015

GENERAL INSTRUCTIONS:

This project is to be done with MATLAB, and you should hand in your printed output during class. Use the `diary` command to save your work in a (text) file (make your life easy and give the file an informative name). If you are familiar with the *publish* command, you can use it to generate your file.

Edit the saved file to include your name, the problem numbers, and the answers to any questions asked in the problems, and delete the mistakes/syntax errors/. Then print your file and turn it in.

You can form groups of 2-3 students from your TA's sections to complete each MATLAB project, if you did so, include in your submission the names of those students with whom you collaborated.

A few general comments (inspired by Prof. Boyle). With the idea that you only learn by doing, everyone in the group must still hand in a MATLAB project. These are not to be copied files -- everyone should do the keyboard work, which is a big part of getting comfortable with using MATLAB. You might work together with your laptops or in a lab. One approach is to work out your assignments side by side on different computers, discussing the commands needed.

If you copy from the result of a joint effort, please explain the work/results in your own words. If you copy without working on the project, then you are cheating. For a given group, your TA will choose one group member's project, grade it, and give everyone in the group that grade.

For access to MATLAB, you can download your own educational version (now for free, see <http://www.it.umd.edu/techsavings/software.html>), use one of the OWL labs or the computers in the library, or to run it from the Engineering Department's Virtual Lab (<http://eit.umd.edu/vcl>).

MATLAB tutoring is available in the OWL lab, see more details at <http://www-math.umd.edu/matlab-tutoring-schedule.html>

There is a MATH 206 online tutorial, which you can use even if you don't sign up for the course <http://www2.math.umd.edu/~immortal/206/tutorial/index.shtml> (especially topic G).

Whenever you use a new MATLAB command learn about it by using the `help` command; e.g., type `help rref` to learn about the *rref* command. When you want to look for a command but you don't know its exact name *'lookfor'* might be helpful. And of course `help-> product help` is a great window to have opened when trying to figure out syntax for a command.

GENERAL Comment:

If this is the first time you are using MATLAB, you may want to watch before attempting the project

- The demos *Basic Matrix Operations*, *Matrix Manipulation*, *Controlling Random Number Generation* and also the videos *Getting Started with MATLAB* (5 min, 18 sec), *Publishing Code from the Editor* (5 min, 15 sec) (all found in Help-> MATLAB->Demos)

MATLAB PROJECT 1:

Due 9/22/2015

The goals of this project are: (1) to be able to input by hand and use MATLAB functions to generate vectors and matrices in MATLAB; (2) to use MATLAB to generate a reduced echelon form for a matrix; (3) to solve a system using the reduced echelon form of its augmented matrix; (4) to investigate the linear dependence of a set of vectors.

PROBLEM 1: Generate a 4x4 matrix based on the birth dates of four people you know and call it A . (Input this by hand; for example, if Time Traveling Terp was planning to use the birthdate of Gabriel Cramer of Cramer's rule fame, 31 July 1704, it will have a row or column containing the numbers 31, 07, 17, 04. Using MATLAB functions, generate B , a 4x4 matrix of ones, a 4x4 matrix of zeroes and I , the 4x4 identity matrix.

Hint: To generate B , O , and I , search for help on the functions *zeros*, *ones*, *eye*.

PROBLEM 2: Based on the matrices in problem 1, compute the following elements and then explain what they are in the corresponding matrix:

(a) $a=A(2,4)$; (i.e. this is the ____ element/row/column of the matrix A)

(b) $\mathbf{ac}=A(:,4)$;

(c) $\mathbf{ar}=A(2,:)$.

Is it true or false that (d) $\mathbf{a}^*B=B^*\mathbf{a}$ and (e) $\mathbf{ac}^*I=I^*\mathbf{ac}$?

Explain your results for Problem 2 points (d) and (e).

PROBLEM 3: (a) Generate a random 3x5 matrix A with entry integers uniformly between -12 and 12. (b) Put it in reduced echelon form using the command *rref*. (c) Are the columns of A linearly independent? Why or why not? (d) What is the span of the columns of A ?

Base your answer on your result at points 3b and your general knowledge of what the Span of 1, 2, 3 linearly independent vectors should be. **Hint:** Search for help on the functions *rand* and *randi*.

PROBLEM 4: Solve problem 34 section 1.2 pp 23 (same in fourth and fifth edition of Lay's textbook).

PROBLEM 5: Using MATLAB, solve problem 4 section 1.10 (same in fourth and fifth edition of Lay's textbook).