CISC106 Summer 2009 Lab06

- Review the code examples from class.
- Some programs below are associated with a question. **Answer the questions** using comments below your code in the m-file.
- The office hours of the TAs and the instructor are on the class website. Visit us!
- **NOTE:** Every function comment section should contain, at a minimum, *three examples* of the function being called and the result of evaluating the call. These examples must include boundary conditions (as discussed in class). Your test files must cover *at least* these exact examples (otherwise, why did you choose them?) and possibly more. Testing is important.
- **Every** M-file you write or modify must be demonstrated, either by running a script test file in a diary or by testing at the command line. Note that if you write function **foo.m** and test script **fooTest.m**, you can demonstrate both by running only fooTest.m (assuming fooTest works).
- **You can now work in pairs!** Please submit individually each problem, but you may work on the assignment with your partner. Please include the name of your partner with your submission.

Problems

1. Create a vector **v** of 20 random numbers using the MATLAB rand function.

   Evaluate:

   ```
   gt = v > 0.5;
   ```

   Now look at the contents of gt, and then use "whos" to answer: What is the data type of gt?

   Now evaluate:

   ```
   v(gt)
   ```

   Explain what you see in the result in terms of v and gt.

   Read 4.3 and 4.3.1 (and refer to class notes). The logical array gt is serving as a mask to select elements of v. In a diary file, create and use this mask to change all elements of v greater than 0.5 to 7, and all other elements to -7.

2. Try this in the interpreter (at the command prompt). When you can do it without mistakes, record it in a diary.

   Create a turtle structure with two fields: 4 legs and a color of your choice.

   Now add a second turtle structure, using the fact that the first turtle was really an array of one turtle, and that the array can be extended the same way we grow a matrix, using a new index and assigning a new value. Give the second turtle both color and legs. After you create the second turtle, show how to display the data in the first turtle and the second turtle.

   Add two more turtles for a total of four. Now write a function that will take the turtle array as a parameter and print each turtle. Demonstrate.

3. Write a function "getCoords" that takes a scalar n and a (two dimensional) matrix as parameters, and prints the row and column coordinates of each instance of n as shown. Your function must use the "find" command to get the coordinates, as shown in lecture.

```
>> getCoords(4, [1 2 4;4 5 6])
     2     1

     1     3
```

4. Read about vectorization in Chapman and review your notes from class. Then write three vectorized **functions** (no loops or recursion allowed!) that:

   (a) Compute $4x - 9$ across a vector (e.g fourXminus9(1:4) is [-5 -1 3 7])

   (b) Compute the area of a circle given the radius (e.g. circleArea(1:3) is [3.1416 12.5664 28.2743])

   (c) Sum all the odd squared numbers from a vector (e.g. sumOddSquares(1:8) is 84).

5. Demonstrate in a diary writing a matrix to a file and reading it back in, as follows:

   (a) Create a matrix x.

   (b) Save it using:

   ```
   >> save x.txt x -ascii
   ```

   (c) Use emacs to open the file x.txt. What do you see?

   (d) Clear the variable x in Matlab.

   (e) Attempt to examine x in Matlab.

   (f) Load the file:

   ```
   >> x = load('x.txt')
   ```

   (g) Attempt to examine x in Matlab.

   (h) Stop your diary.

If your TA requires a paper copy, be sure that you have a printed copy of your function M-files, script M-files,image files, and diary files demonstrating your testing. All must be stapled together, with your name and lab section on the top page.

Be sure that you upload a copy of all the MATLAB function, script, imasge, and diary files to Sakai. Then, click submit ONLY ONCE to send these to your Sakai and your TA.

On the first page of every printed copy for this course, your name, section, and TA's name must appear.