## Midterm 1 Review

These questions are designed to help you think about course material, not to show you actual exam questions. The exam will be about 40-60 percent multiple choice, as discussed in class. The remainder will be short answer or pseudo-coding.

Research shows that the best way to study for an exam is with other people. In group study, the people who start knowing more learn more (think about why), so don't think that it is only valuable to study with people who know more than you do.

## **Topic list**

- Unix commands
- if statements
- relational operators
- arrays (or matrices)
- loops (for and while)
- scripts
- output
- functions
- recursion (knowledge-level only)

## **Study points**

- 1. What are the differences between a script and a function? Both are stored in M-files. Why have both?
  - (a) Which has global variables whose use affects other Matlab variables?
  - (b) Which must be passed parameters if its use depends on external values?
  - (c) Which can be evaluated as an expression to yield a value?
- 2. There are important differences between values that are printed and output values. Consider the following function definitions, and assume they are in three different M-files:

```
function [] = f(x)
  disp(x);
end
function result = g(x)
  result = 2*x;
end
function output = h(x)
  result = 3*x;
end
```

Which of the following function calls will run correctly?

- (a) >> f(1) (b) >> g(1) (c) >> h(1) (d) >> x = f(1) (e) >> x = g(1) (f) >> x = h(1) (g) >> fprintf('%f', f(1)) (h) >> fprintf('%f', h(1)) (i) >> disp(g(1)) (j) >> disp(h(1))
- 3. Give three reasons why it is good practice to decompose a task into lots of small functions, rather than writing a few long functions?
- 4. Given the following steps in the software design process, put them in order and defend your ordering.
  - (a) write tests for functions
  - (b) design algorithm
  - (c) write functions (bottom up) and use tests
  - (d) decompose into "black boxes" (functions)
- 5. What is "Unit testing"?

## 0.1 Ballpark using powers of two

- 6. Suppose an elephant record takes 506 bytes. Give a slightly high approximation of the amount of memory required to store 15.8 million elephants.
- 7. Suppose hard drive has 32,000,000,000 bytes. About how many cow records can the drive store if each cow takes 250 bytes?
- 8. Assume that you have two directories inside your home directory, lab01 and lab02. If lab02 is your current directory at the start of each of the following questions, show how to use a single Unix shell command to:
  - (a) make home your current directory
  - (b) make lab01 your current directory
  - (c) copy file spam.txt from lab01 to lab02
  - (d) move file spam.txt from lab02 to lab01
  - (e) change the name of spam.txt in lab02 to vegemite.txt
  - (f) list the files in lab02

- (g) delete the file marmite.txt from lab02
- (h) display the name of the current directory
- (i) show all .m files in the current directory
- (j) change in to your home directory and create a directory for lab03 (you may use two commands for this one).
- 9. Find the bug in a program similar to one you wrote for lab (to do this, get a study mate to put a bug in three M-files, and you do the same for them, then swap papers).
- 10. Given a test script, write the function that it is supposed to test.
- 11. Given a function, write a test script for it (on the exam, you would be expected to identify boundary cases without a reminder).
- 12. Write the format specifier that goes in the blank below:

fprintf('The answer is: \_\_\_', 12.123);

so that it will print the following exactly (there are seven spaces):

The answer is: 12.123

- 13. Given a function that you wrote in lab that has a missing line or section of code, fill in the missing code.
- 14. Evaluate relational and logical expressions as Matlab does:
  - (a) 4 < 5 & 6 > 7
  - (b)  $(5! = 5) \mid 1$
  - (c) !(1 & 1 | 0)
  - (d) 4 & 3 < 2
- 15. Write an if statement that prints "boo" if a number is between 12 and 17, inclusive.
- 16. Write code that prints "blue" for numbers less than 5, "green" for numbers from 5 to 10 inclusive, and "mauve" for numbers higher than 10.
- 17. Draw a recursive function trace to match a given test case for a recursive function.
- 18. Write a for loop to display the even numbers from 0 to 10.
- 19. Write a for loop to count the number of sevens in a matrix x.
- 20. Write a for loop to change each seven in a matrix x to an 8.
- 21. Write a for loop to sum the elements in a two-dimensional matrix x.
- 22. In a diary demonstrate all the following:
  - (a) Create a row vector called "a" with the even numbers from 0-6, inclusive, by specifying an interval.
  - (b) Show how to extract the number 4 from a

- (c) Set "b" to the transpose of a (i.e. b will be a column)
- (d) Show how to change the 4 in b to a 7;
- (e) Use a for loop to display each member of b.
- (f) Create a matrix "c" with three rows and four columns, with consecutive integers starting at 1 in the first row, 5 in the second row, 9 in the third.
- (g) Show how to extract the numbers 7 and 11 from c.
- (h) Set the 10 in c to 10.5
- (i) Set "d" to be the third column from c.
- (j) Set "e" to be the second row from c.
- (k) From Chapman 2.5, Quiz 2.2 number 1, parts a-f.
- 23. ASCII stuff: Given the integer which corresponds to 'A', show a loop that will print the alphabet (all caps). Use the char and double functions.
- 24. Given some data in matrices, show how to plot it using the plot function.
- 25. Write by hand pseudo-code for every program in your labs. Then compare it to your working code and see what is different; re-write until your hand-written code is aesthetically pleasing as well as functional. Remember, you will have to write pseudo-code by hand on the exam; practice.
- 26. How could we handle testing the output of functions when there may be slight differences in the precision of the answers?