ENGR 121: Computation Lab I

Handout for Lab 3: Simple Scripts and Plots

Practice Exercises

1. Write a script to calculate the volume of a hollow sphere,

$$\frac{4\pi}{3}(r_o^3 - r_i^3)$$

where r_i is the inner radius and r_o is the outer radius. Declare variables for the inner and outer radii and assign values to them. Using these variables, assign the volume to a third variable. Include comments in your script.

2. Modify the above script to now prompt the user for the values of r_i and r_o using the **input** function.

3. The **input** function can be used to enter a vector, such as

```
>> vec = input('Enter a vector: ')
Enter a vector: 4:7

vec =

     4     5     6     7
```

Experiment with this and find out how the user can enter a matrix.

4. Write an **input** statement that will prompt the user for a real number and store it in a variable. Then use the **fprintf** function to print the value of this variable using two decimal places.

5. If the lengths of two sides of a triangle and the angle between them are known, the length of the third side can be calculated. Given the lengths of two sides b and c, respectively, and the angle between them, α, in degrees, the third side a is given by

$$a^2 = b^2 + c^2 - 2bc\cos(\alpha)$$

Write a script called $thirdside$ that will prompt the user and read in values for b and c, and α (in degrees), and print the value of a correct to three decimal places. Comment your code clearly. The format of the output from the script should look exactly like this:

```
>> thirdside
Enter the first side: 2.2
Enter the second side: 4.4
Enter the angle between them: 50
The third side is 3.429
```

6. Write a script to plot **sin(x)** for x values ranging from 0 to π in separate Figure windows: using 10 points in this range; using 100 points in this range.

7. Write a script to do the following. Generate a random integer n, create a vector of the integers 1 through n in steps of 2, square them, and plot the squares. Label the plot clearly and provide an appropriate title.

8. Atmospheric properties such as temperature, air density, and air pressure are important in aviation. Create a file that stores temperature in degrees Kelvin at various altitudes. The altitudes (in feet) are in the first column and the temperatures are in the second. For example, the data file might look like this:

```
1000 288
2000 281
3000 269
```

Write a script that will load this data into a matrix, separate the matrix into two vectors, and then plot the data with the appropriate axis labels and a title.

9. A file "floatnums.dat" has been created for use in an experiment. However, it contains float (real) numbers and what is desired instead is integers. Also, the file is not exactly in the correct format either. The values are stored columnwise rather than rowwise. For example, if the file contains the following:

```
90.5792   27.8498   97.0593
12.6987   54.6882   95.7167
91.3376   95.7507   48.5376
63.2359   96.4889   80.0280
9.7540   15.7613   14.1886
```

what is really desired is:

```
91    13    91    63    10
28    55    96    96    16
97    96    49    80    14
```

Create the data file in the specified format. Write a script that reads from the file *floatnums.dat* into a matrix, rounds the numbers, and write the matrix in the desired format to a new file called *inputnums.dat*.