ENGR 1204 Programming Languages in Engineering
Homework 4

For each problem, print out the script file if created along with the function file(s) and the relevant Command Window output. Also, show analytical work where appropriate.

1. (25 points) The cost of manufacturing n units (where n is an integer) of a particular product at a factory is given by the equation:

$$c(n) = 5n^2 - 44n + 11$$

Write a script mfgcost that will
- prompt the user for the number of units n
- call a function costn that will calculate and return the cost of manufacturing n units
- print the result (the format must be exactly as shown below)

Next, write the function costn, which simply receives the value of n as an input argument, and calculates and returns the cost of manufacturing n units.

Here is an example of executing the script:

>> mfgcost

Enter the number of units: 100

The cost for 100 units will be $45611.00

Verify the result shown for $n = 100$ and for n = # # #, where # # # are the last three digits of your student ID number.

2. (25 points) A water tank consists of a cylindrical part of radius r and height h, and a hemispherical top. The tank is to be constructed to hold $600\ m^3$ when filled. The surface area of the cylindrical part is $2\pi rh$, and its volume is $\pi r^2 h$. The surface area of the hemispherical top is given by $2\pi r^2$, and its volume is given by $\frac{2}{3}\pi r^3$.The cost to construct the cylindrical part of the tank is $400 per square meter of surface area; the hemispherical part costs $600 per square meter. Use the fminbnd function to compute the radius that results in the least cost. Compute the corresponding height h.

Create a user function file fwater.m to be accessed by MATLAB's fminbnd function. Then create a script to display the radius, height and minimum cost. A recommended range for the tank radius is 2 to 10 (meters).

3. (25 points) Create a vector x which consists of 20 equally spaced points in the range of –π to

π.

Create a y vector which is sin(x).

Use the linspace function in the command mode. Copy and paste the command and result to Word. Then add the command

>> plot(x,y) , grid

To include the plot with your print-out, in the Figure window select Edit and Copy Figure. Paste it into your Word document.

4. (25 points) This exercise can be done in the command mode.
Create matrices A and B as shown:

$$A = \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix}, \qquad B = \begin{bmatrix} 6 & -4 \\ -8 & 2 \end{bmatrix}$$

(a) Perform the following array (element by element) operations and apply the MATLAB functions shown. Verify your results analytically.

A + B A – B A .* B A ./ B A .^ B

sqrt (A)	Square root
log(A)	Natural log
log10(A)	Common log

(b) Create matrices C and D as shown:

C = [A; B] D = [A, B]

Perform the following operations:

C + D C .* D C * D