ECOR 1010 – INTRODUCTION TO ENGINEERING

ASSIGNMENT #8

Assignment Title: Programming With MATLAB

TO Marking TA:

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Number of Figures and Tables (Including handwritten ones): 8

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INTRODUCTION

Matlab, an engineering software that excels at solving longer, time consuming problems was previously used to solve matrices, and now is used for programming. Offering a wide range of commands, functions, and tools, MATLAB proves its importance and usefulness for all engineers, either solving longer matrices and equations with multiple unknowns, or general programming. Hence, MATLAB is considered as an convenient tool to solve smaller problems most engineers need to solve routinely.

MATERIALS AND METHODS

MATLAB was used to obtain all results and outputs, including the graphs. For Figure 1, a function was created in which there were two inputs that multiplied to gain the output. In Figure 2, another function was created in which a number is multiplied by the square of the other number in a function to provide the output, and was put into a table. In Figure 3, a piecewise function was solved and plotted by using various commands as shown in the appendices (Figure 4). Then, the results were tested to provide both Figures 5 and 6. As in Figure 7, both the fuel efficiency and fuel consumption were determined, using a function that returns the fuel consumption in L/100km for the input values of the distance covered, and creating a table which shows different statistics within the span of 6 months. Then, different commands were used to show the results in a plot with labelled axes. Finally, in Figure 9, the student number was used as an input to obtain the output graph shown in Figure 10.

RESULTS

For Figure 1, a function was created and tested, as if the input number were 5 and 6, the result would be 30 as shown. As for Figure 2, a table and an answer of (8 0 72) was gained by reproducing a function. For Figure 3, after implementing the piecewise function, a plot was created following the requirements (Figure 4). After the creation of the fuel data table in Figure 7, the average fuel efficiency was shown to be 26.9150, and the average fuel consumption was 8.7830 (refer to appendix both the fuel data's table and plot). As for Figures 9 and 10, using the student number as an input, and following certain restrictions and functions, a plot was created.

DISCUSSION

Using MATLAB as a programming software and an aid to solve mathematical problems proved to be both time-saving and efficient. MATLAB was not only used for programming and solving such problems, but was also used to obtain graphs from the gathered results. MATLAB was tested in both script files and functions, which are different in some areas. While functions include both an input and an output, script files are m-files that contain statements and would operate only on previously defined variables when coded. Thus, functions seem to have an advantage as they could be used in numerous ways with different data, while script files operate on defined variables and is dependent on tasks that wouldn't change.

CONCLUSIONS

This lab shows how both MATLAB functions and script files are used, along with different MATLAB tools such as plotting. After all, this lab proves how essential MATLAB is for many different aspects of engineering problems, including programming.

```
function output = g(x,y)

%Function that produces a product from
the multiplication of x and y

a=x*y;

output = a;

end
```

Check:

```
>> x=5

>> y=6

>> g(x,y)

ans =  30
```

Figure 1:Reproducing a function of x and y (Q1)

```
function output = output(x,y)

if length(x)==length(y)

a= x *y.^2;

output = a;

fprintf('x   y    output\n')

for i =1:length(x)

    output(i) = x(i).*y(i).^2;

    fprintf('%2.1f   %2.1f   %2.1f \n',  x(i),  y(i),  output(i))

end

else

    error('Length of x and y are not equal')

end

end

>> x = [8,0,2]

>> y = [1;10;6]

>> output(x,y)

x      y      output

8.0   1.0      8.0

0.0   10.0     0.0

2.0   6.0      72.0

ans = 8      0     72
```

Figure 2: Modifying the code (Q2)

```
t = linspace(-2,20,10000);

y=t;

for i = 1 :length(t)

   if (t(i) > 10)

    y(i)= -2*cos(0*t(i))*exp(-0.1*(t(i)-10));


   else if t(i) >= 0 && t(i) <= 10

    y(i) = -2*cos(0*t(i));

       else if t(i) < 0

               y(i) = -2

           end

       end

end

end




grid on

plot(t,y);

xlabel('x-axis')

ylabel('y-axis')

 title ('Piece-wise function: 02')
```

Figure 3: Piece-wise function (Q3)

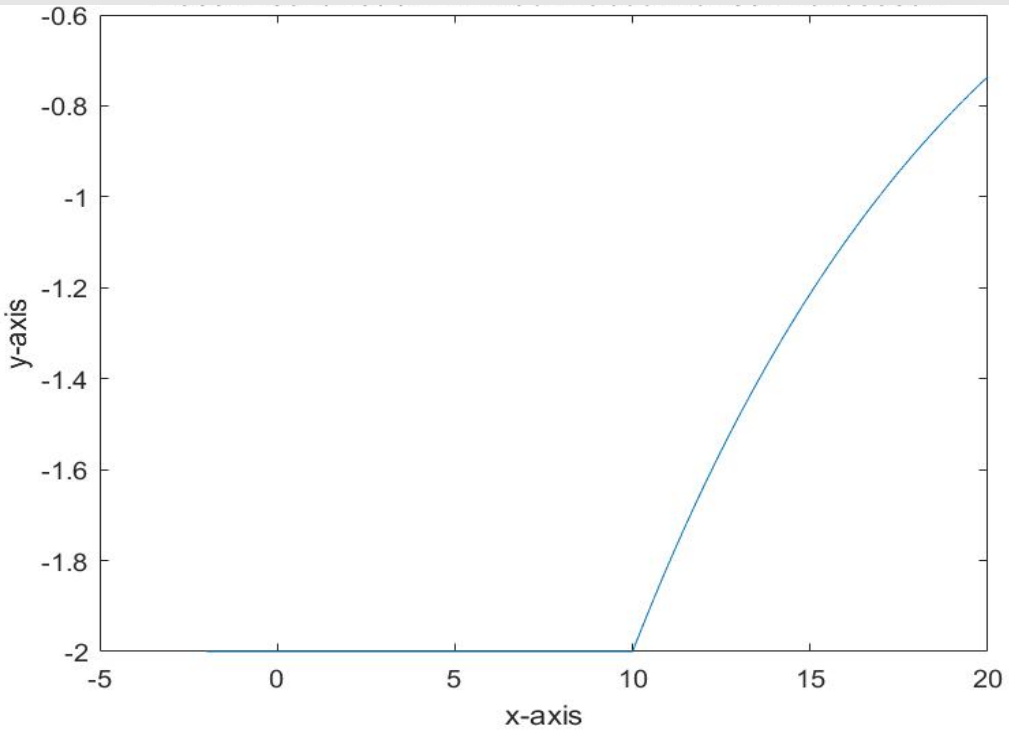

Figure 4: Piece-wise function plot

TEST FOR QUESTION 3: Second to last student number digit was changed from 0 to 3, thus ω=3

```
t = linspace(-2,20,10000);

y=t;

for i = 1 :length(t)

   if (t(i) > 10)

    y(i)= -2*cos(3*t(i))*exp(-0.1*(t(i)-10));


   else if t(i) >= 0 && t(i) <= 10

    y(i) = -2*cos(3*t(i));

       else if t(i) < 0

               y(i) = -2

           end

       end
```

```
end

end




grid on

plot(t,y);

xlabel('x-axis')

ylabel('y-axis')

 title ('P')
```

Figure 5: Figure 3 Test

Result: An oscillating graph, therefore the value 0 from the original question altered this result.

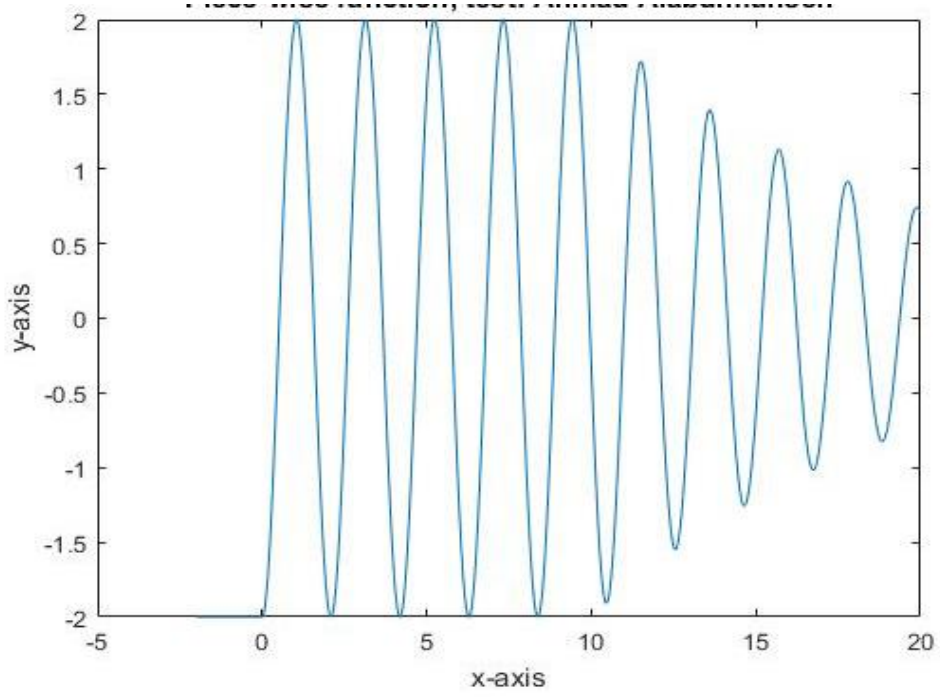

Figure 6: Figure 3 Test plot - Figure 5 plot

```
Month = [1;2;3;4;5;6];

Distance = [2445;2485;2115;2733;2084;2539];

Fuel = [210;234;172;220;206;219];

MPG = (Distance./Fuel)*(3.785/1.61);

Consumption = (Fuel./(Distance./100));

fprintf ('Month  Distance (km)  Fuel (L)    MPG      L/100Km \n')

for i=1:length(Month)

    fprintf('%1.0f          %4.0f       %3.0f       %1.3f       %3.0f\n',
Month(i),Distance(i),Fuel(i),MPG(i),Consumption(i))

end

plot (Month,Consumption)

title('-')

xlabel('x-axis')

ylabel('y-axis')

s= sum(MPG)/6;

disp('The average fuel effeciency is')

disp(s)

e= sum(Consumption)/6;

disp('The average fuel consumption is')

disp(e)
```

```
>> Untitled4
Month  Distance (km)  Fuel (L)     MPG      L/100Km
1          2445       210        27.372          9
2          2485       234        24.966          9
3          2115       172        28.908          8
4          2733       220        29.205          8
5          2084       206        23.783         10
6          2539       219        27.256          9
```

```
The average fuel effeciency is

   26.9150

The average fuel consumption is

    8.7830
```

Figure 7: Fuel data (Q4)

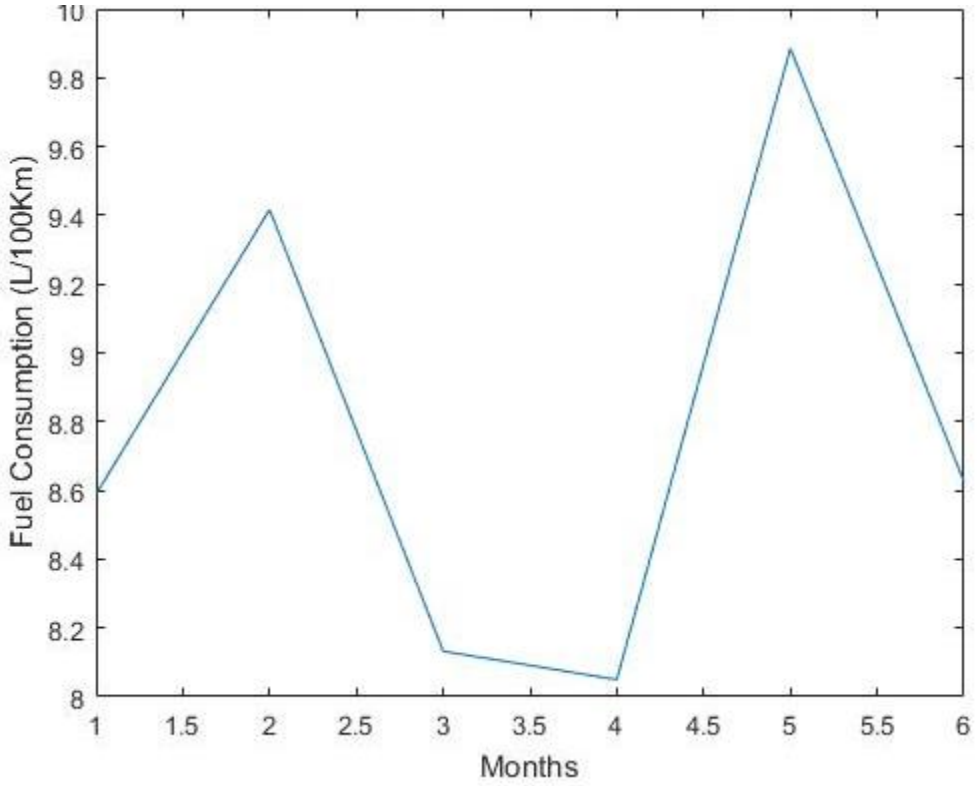

Figure 8: Fuel data plot

```
function x=Num(y)

y= input ('Student No.:')

Numbers = 0;

while y> 1

    if rem (y,2) == 0

        y=y/2;

    else

        y = (y*3)+1;

    end

    Numbers = Numbers+1;

    x(Numbers) = y;


    display (Numbers)


     x= fliplr(x);

     plot(log10(x))

end



xlabel('x-axis')

ylabel('y-axis')

 title ('Q6:)
```

Figure 9: Student number input (Q5)

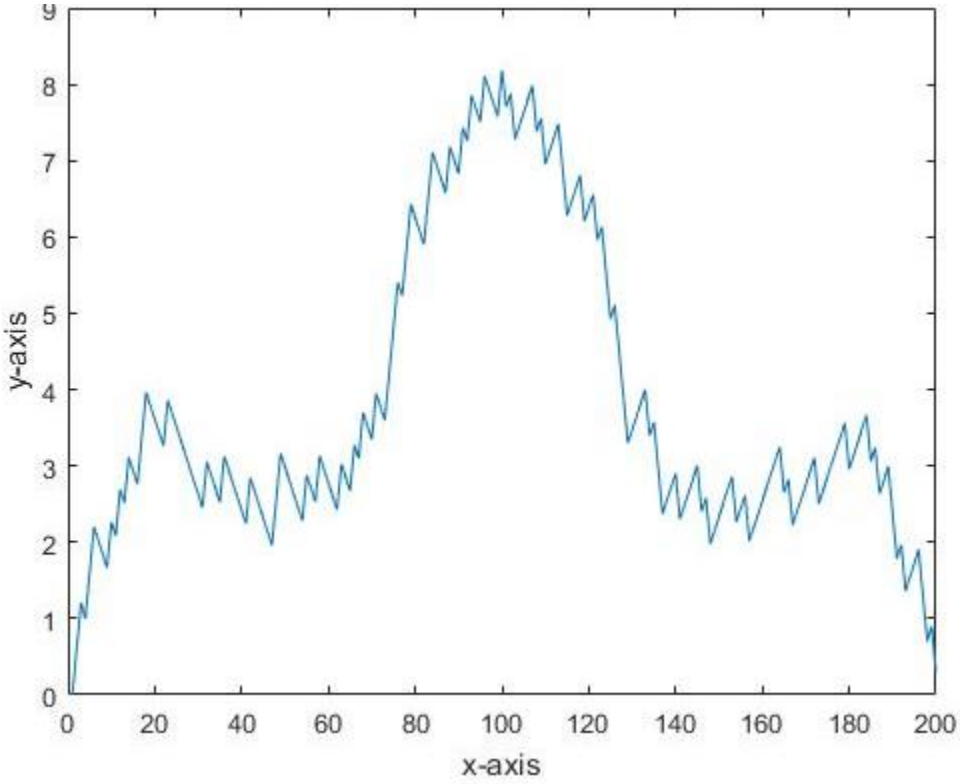

Figure 10: Figure 9's plot