Matlab-3

Mean Value Theorem

Name: Om Ashish Mishra

Registration Number: 16BCE0789

MEAN VALUE THEOREM

Expeiment 3 (25-07-2016)

Aim:

Find the global extrema of the function f(x) = x2 exp(sin x) – x/ x3 + 1 , on the interval [0, 5].

New Commands:

clearvars: removes all variables from the currently active workspace.

vectorize(s): where s is a string expression, inserts a . before any ^, * or / in s. The result is a character string.

inline(expr): constructsaninlinefunctionobjectfromtheMATLABexpression contained in the string expr.

x = fzero(fun, x0): tries to find a point x where fun(x) = 0. This solution is where fun(x) changes sign.

n = numel(A): returns the number of elements, n, in array A.

C = unique(A): returns the same data as in A, but with no repetitions. The values of C are in sorted order.

linespace

The code:

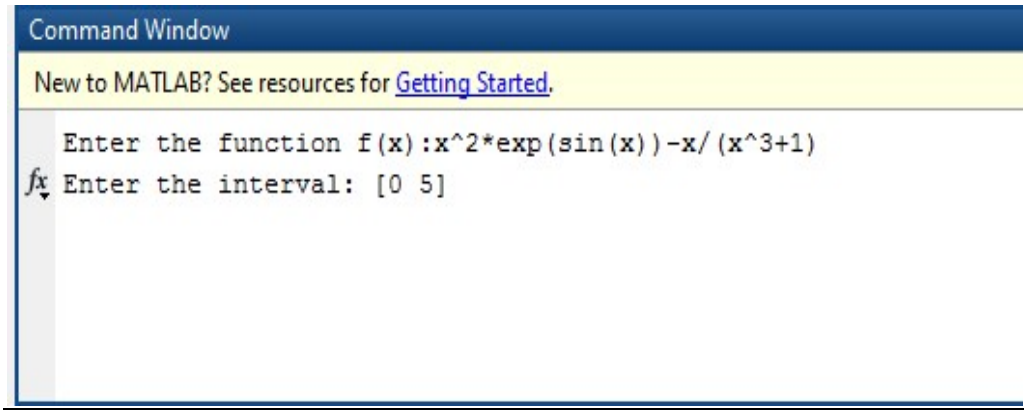
```
clc
clearvars
syms x
f = input('Enter the function f(x):');
I = input('Enter the interval: ');
df = diff(f,x);
ddf = diff(df,x);
f = inline(vectorize(f));
df = inline(vectorize(df));
ddf = inline(vectorize(ddf));
range = linspace(I(1),I(2),100);
```

```
plot(range,f(range),'−b','LineWidth',2);
legstr = {'Function Plot'}; % Legend String
hold on;
guesses = linspace(I(1),I(2),5);
root = zeros(size(guesses));
for i=1:numel(guesses)
        root(i) = fzero(df,guesses(i));
end
root = root(I(1) <= root & root <= I(2));
root = unique(round(root,4));
plot(root,f(root),'ro','MarkerSize',10);
legstr = [legstr, {'Critical Points'}];
disp(['Critical Points of f(x) are: ',num2str(root)])
maxp = root(ddf(root) < 0);
if(numel(maxp) ~= 0)
        disp(['Local maximum of f(x) occurs at: ',num2str(maxp)])
end
minp = root(ddf(root) > 0);
if(numel(minp) ~= 0)
        disp(['Local minimum of f(x) occurs at: ',num2str(minp)])
end
fval = f(root);
if(numel(maxp) ~= 0)
        gmax = root(fval == max(fval));
        disp(['Global maximum of f(x) occurs at: ',num2str(gmax),' and its value is: ', num2str(
        max(fval))])
```

```
        plot(gmax,f(gmax),'m+','MarkerSize',10);

        legstr = [legstr, {'Global Maximum'}];
end
if(numel(minp) ~= 0)
        gmin = root(fval == min(fval));
        disp(['Global minimum of f(x) occurs at: ',num2str(gmin),' and its value is: ', num2str(
        min(fval))])
        plot(gmin,f(gmin),'m*','MarkerSize',10);
        legstr = [legstr, {'Global Minimum'}];
end
legend(legstr,'Location','Best')
```

Input:



Output:

```
Command Window
New to MATLAB? See resources for Getting Started.

Enter the interval: [0 5]
Critical Points of f(x) are: 0.2953      2.5092      4.2139
Local maximum of f(x) occurs at: 2.5092
Local minimum of f(x) occurs at: 0.2953      4.2139
Global maximum of f(x) occurs at: 2.5092 and its value is: 11.2209
Global minimum of f(x) occurs at: 0.2953 and its value is: -0.17123
fx >>
```

Graph: