



MATLAB EXPERIMENT 1B

Maxima and Minima of a function of one variable



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Department of Mathematics
School of Advanced Sciences
MAT 1011 – Calculus for Engineers (MATLAB)
Experiment 1-B
Maxima and Minima of a function of one variable
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Question 1:

Find the local and global maxima and minima for the function $x^3 - 12x - 5$ on $x \in (-4, 4)$.

Code:

```
clear
clc
close all
syms x
%the given function and interval
f(x)= x^3-12*x-5;
I=[-4,4];

f1(x)=-f(x);
%End values of the interval
a=I(1);b=I(2);
t=linspace(a,b,100); %create 100 points in between a and b
(in the interval)
g=double(f(t)); %Finding the values of f(x) at t values
```

```

[lmax_f,loc]=findpeaks(g);
lmax_x=round(t(loc),4);
h=double(f1(t));
[lmin_f,loc]=findpeaks(h);
lmin_x=round(t(loc),4);

disp('Local maximum occur at x=')
disp(lmax_x)

disp('The Local Maximum value(s) of the function are ')
disp(double(f(lmax_x)))

disp('Local minimum occur at x=')
disp(lmin_x)

disp('The Local Minimum value(s) of the function are ')
disp(double(f(lmin_x)))

%Plotting the function
plot(t,f(t));
hold on;
%Pointing the local maxima on the curve of f(x)
plot(lmax_x,double(f(lmax_x)),'or');
%Pointing the local minima on the curve of f(x)
plot(lmin_x,double(f(lmin_x)),'*g');
hold off

```

OUTPUT:

```

Local maximum occur at x=
    -1.9798

```

```

The Local Maximum value(s) of the function are

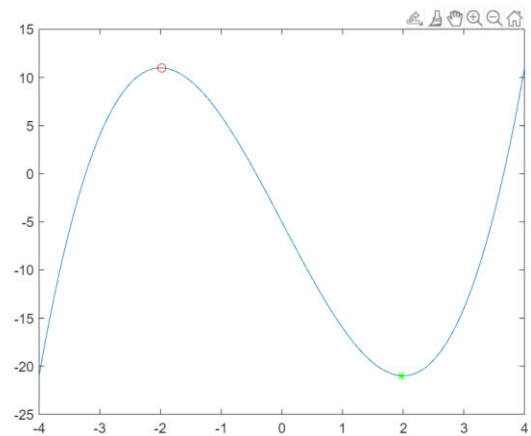
```

10.9976

Local minimum occur at x=
1.9798

The Local Minimum value(s) of the function are
-20.9976

```
1 clear
2 clc
3 close all
4 syms x
5 %the given function and interval
6 f(x)= x^3-12*x-5;
7 I=[-4,4];
8 f1(x)=-f(x);
9 %End values of the interval
10 a=I(1);b=I(2);
11 t=linspace(a,b,100); %create 100 points in between a and b (in the interval)
12 g=double(f(t)); %Finding the values of f(x) at t values
13 [lmax_f,loc]=findpeaks(g);
14 lmax_x=round(t(loc),4);
15 h=double(f1(t));
16 [lmin_f,loc]=findpeaks(h);
17 lmin_x=round(t(loc),4);
18 disp('Local maximum occur at x=')
19 disp(lmax_x)
20 disp('The Local Maximum value(s) of the function are ')
21 disp(double(f(lmax_x)))
22 disp('Local minimum occur at x=')
23 disp(lmin_x)
24 disp('The Local Minimum value(s) of the function are ')
25 disp(double(f(lmin_x)))
26 %Plotting the function
27 plot(t,f(t));
28 hold on;
29 %Pointing the local maxima on the curve of f(x)
30 plot(lmax_x,double(f(lmax_x)),'or');
31 %Pointing the local minima on the curve of f(x)
32 plot(lmin_x,double(f(lmin_x)),'g');
33 hold off
```



09:44

Command Window

```
Local maximum occur at x=
-1.9798

The Local Maximum value(s) of the function are
10.9976

Local minimum occur at x=
1.9798

The Local Minimum value(s) of the function are
-20.9976
```

>>

09:44

QUESTION 2:

Find the local and global maxima and minima for the function $x + \sin 2x$ on $x \in (-5, 5)$.

CODE:

```
clear
clc
close all
syms x
%the given function and interval
f(x)= x+ sin(2*x);
I=[-5,5];
f1(x)=-f(x);
%End values of the interval
a=I(1);b=I(2);
t=linspace(a,b,100); %create 100 points in between a and b
(in the interval)
g=double(f(t)); %Finding the values of f(x) at t values
[lmax_f,loc]=findpeaks(g);
lmax_x=round(t(loc),4);
h=double(f1(t));
[lmin_f,loc]=findpeaks(h);
lmin_x=round(t(loc),4);
disp('Local maximum occur at x=')
disp(lmax_x)
disp('The Local Maximum value(s) of the function are ')
disp(double(f(lmax_x)))
disp('Local minimum occur at x=')
disp(lmin_x)
disp('The Local Minimum value(s) of the function are ')
disp(double(f(lmin_x)))
%Plotting the function
plot(t,f(t));
hold on;
%Pointing the local maxima on the curve of f(x)
plot(lmax_x,double(f(lmax_x)),'or');
```

```
%Pointing the local minima on the curve of f(x)
plot(lmin_x,double(f(lmin_x)),'*g');
hold off
```

OUTPUT:

Local maximum occur at x=

Column 1
-2.0707
Column 2
1.0606
Column 3
4.1919

The Local Maximum value(s) of the function are

Column 1
-1.2293
Column 2
1.9129
Column 3
5.0548

Local minimum occur at x=

Column 1
-4.1919
Column 2
-1.0606
Column 3
2.0707

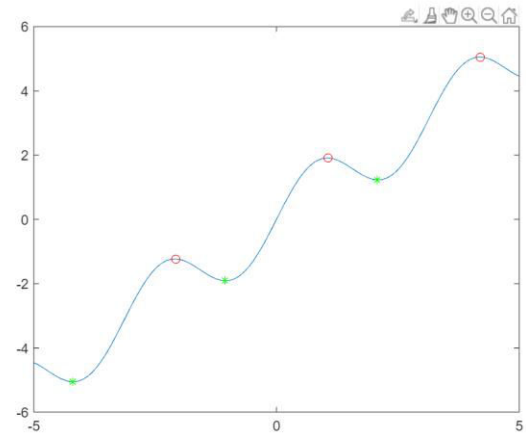
The Local Minimum value(s) of the function are

Column
-5.0548
Column 2
-1.9129
Column 3
1.2293

```

1 clear
2 clc
3 close all
4 syms x
5 %the given function and interval
6 f(x)= x+ sin(2*x);
7 I=[-5,5];
8 f1(x)=-f(x);
9 %End values of the interval
10 a=I(1);b=I(2);
11 t=linspace(a,b,100); %create 100 points in between a and b (in the interval)
12 g=double(f(t)); %Finding the values of f(x) at t values
13 [lmax_f,loc]=findpeaks(g);
14 lmax_x=round(t(loc),4);
15 h=double(f1(t));
16 [lmin_f,loc]=findpeaks(h);
17 lmin_x=round(t(loc),4);
18 disp('Local maximum occur at x=')
19 disp(lmax_x)
20 disp('The Local Maximum value(s) of the function are ')
21 disp(double(f(lmax_x)))
22 disp('Local minimum occur at x=')
23 disp(lmin_x)
24 disp('The Local Minimum value(s) of the function are ')
25 disp(double(f(lmin_x)))
26 %Plotting the function
27 plot(t,f(t));
28 hold on;
29 %Pointing the local maxima on the curve of f(x)
30 plot(lmax_x,double(f(lmax_x)),'or');
31 %Pointing the local minima on the curve of f(x)
32 plot(lmin_x,double(f(lmin_x)),'g');
33 hold off

```



```
Command Window
Local maximum occur at x=
Column 1
-2.0707

Column 2
1.0606

Column 3
4.1919

The Local Maximum value(s) of the function are
Column 1
-1.2293

Column 2
1.9129

Column 3
5.0548

Local minimum occur at x=

Column 1
-4.1919

Column 2
-1.0606

Column 3
2.0707

The Local Minimum value(s) of the function are
Column 1
-5.0548

Column 2
-1.9129

Column 3
1.2293

>>
```

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