MAT1011-MATLAB-ASSESSMENT 1

PROBLEM 1

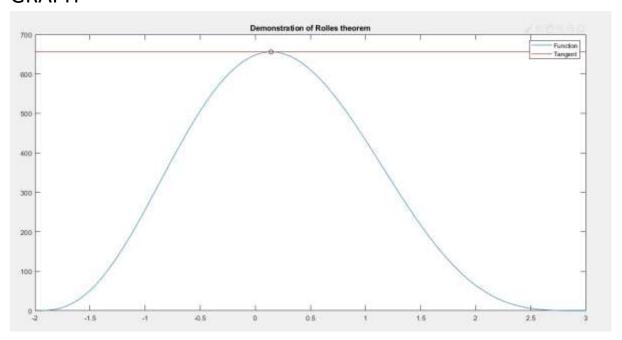
Verify Rolle's theorem for the function $(x+2) ^3(x-3) ^4$ in the interval $[-2 \ 3]$. Plot the curve along the secant joining the end points and the tangents at points which satisfy Rolle's theorem.

```
clear all;
       cler
       syms x c;
       f=input('Enter the function: ');
       I=input('Enter the interval [a,b]: ');
       a=I(1); b=I(2);
       fa=subs(f,x,a);fb=subs(f,x,b);
       df wdiff(f,x); dfc wsubs(df,x,c);
       if fa==fb
       c=solve(dfc);
       count=0;
     Ofor i=1:length(c)
12
13
       if c(i)>a $6 c(i)<b
       count=count+1;
18
       values=sprintf('The values of c between %d and %d which satisfy Rolles theorem are x=',a,b);
19
       disp(values)
       disp(r)
21
22
       disp('f(a) and f(b) are not equal, function doesnot satisfy conditions for Rolles theorem');
23
24
       tval=subs(f.x.r);
25
       xval=linspace(a,b,100);
       yval=subs(f,x,xval);
27
       plot(xval, yval);
28
29
       [p,g]=size(xval);
     [] for i=1:length(tval)
           hold on;
       plot(xval,tval(i)*ones(p,q),'r');
      hold on;
       hold on;
33
      plot(r(i),tval(i),'ok');
34
       end
35
       hold off:
       legend('Function','Tangent');
       title('Demonstration of Rolles theorem');
```

```
Enter the function: (x+2)^3*(x-3)^4
Enter the interval [a,b]: [-2 3]
The values of c between -2 and 3 which satisfy Rolles theorem are x=
1/7

f<sub>x</sub> >> |
```

GRAPH



PROBLEM2

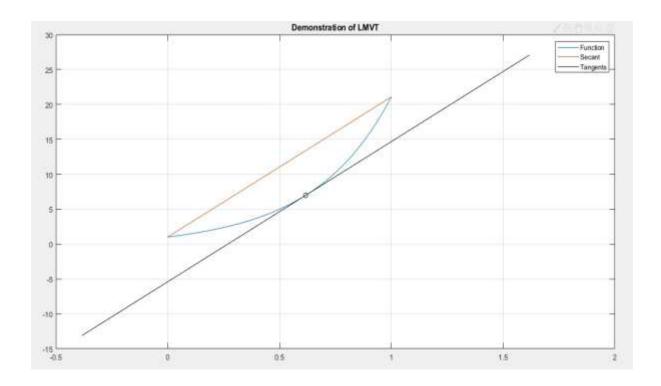
Verify Legrange's mean value theorem for $f(x)=x+e^3x$ in the interval [0,1]. Pot the curve with the secant joining the end points and tangents at points which satisfy LMVT.

```
clear all:
          where e c)
           fringut | Error the function: '}!
          1=input('Enter the interval (a,0); ');;
a=1(1); b=1(2);
fa=subs(f,x,a);fb=subs(f,x,b);
          of-diff(f,s)/
          ofc=subs(df, x, c);
LH=dfc-(fb-fs)/(b-s)/
建加斯拉斯拉拉 打破打 经拉斯特特的 打印
          stecive (LH):
           count=0:
       If co i=lilength(c)
          count = c(1);
          end
end
          fprietf("The values of a between hit and his which swilety UDVT ere e-", a, b); disp(double(ta))
           nvalwlinspace(a,b,100):
          prol-subs(f, x, xral); smeads(df, ta) ; b Slopes of tangents at the points between a soft h.
           tymmin(f, m, tm) :
          plot(mval,yval):
          hold our
          moid on;
secant_slope=(fb-fe)/(b-e);
secant_line=fa=secant_slope*(x-a);
sx_yx=xwal;
sy_vxl=xwal;
sy_vxl=xwal;
plot(sx_val, sy_val);
sold on;
29
30
11
11
          word out
      | for i=1:length(tx)
34
25
          taval=linspace(tx(i)-1,tx(i)+1,20);
          t_line=ty(i)+n(i)+(s-tx(i));
          tyvel=subs(t_line, x, twvel);
plot(txval, tyvel, '8');
33
          plot(tx(1),ty(1),'sk')r
40
          end
41
         Bold offa
42
          grad en
          legend('Eunchium', 'Secunt', 'Tangenta');
```

```
Enter the function: x+exp(3*x)
Enter the interval [a,b]: [0 1]
The values of c between 0 and 1 which satisfy LMVT are x= 0.6168

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PROBLEM 3

Find the local and global maxima and minima for the function $x^3-12x-5$, x [-4,4]

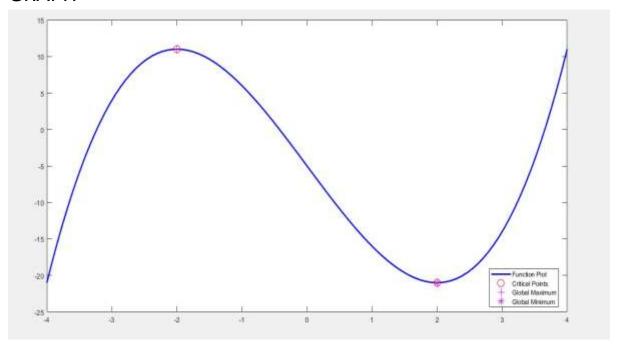
```
clear all
         вупа з
         f * imput("Eurer the function fix(:");
         I = imput('fater the interval: ');
         a=1(1):b=1(2):
        df = mff(f,m);
         dof = diff(df,x);
         f = inline(vectorize(f));
         if * inline(vectorise(if));
11
        dof = inline(vectorize(ddf));
range = linspace(a,b,100);
12
         plot(range,f(range),'-k','LineWillth',2);
legetr = ('Function Flot'); % Legend String
14
15
         hold on:
24
         ******
17
         k Due to limitations in symbolic toolbox we find the serns of
13
         % f'(x) numerically:
19
         *******
         guesses = linspace(a,b,5);
21
21
         coot - seros(mine(pueses)):
      for 1-limmel(queeses)
22
23
         root(1) = frero(df, quesses(1));
24
         root = root(a c= root a root c=b);
25
26
         root = unique(round(root, 4));
P
         plot(root,f(root),'ro', 'MarkerSize',10))
21
         legets = [legets, ("Critical Points")];
29
         disp(['Critical Prints of f(s) are: ',numbetr(root)])
31
         .....
21
         We categorize the critical points by the second derivative test
11
14
33
         *******
        maxp = root(dif(root) < 0);
34
        if (numel (many) -= 0)
25
        disp(f'local masses of f(s) occurs at: ',macktr(masp())
27
        ming = root(ddf(root) > 0);
兹
        if(numel(minp) -= 0)
        disp[['local minimum of f(x) occurs et: ',magstr(minpt])
39.
40
        end
        fwal = f(root);
41
42
        if(numel(maxp) -= 0)
13
        gmax - root(fval -- max(fval));
        disp(['Global maximum of f(s) completer(, sum2str(gmax), seed its value isn', num2str(max(fval))))
plot(gmax, 'gmax), 's-', 'Maximum', 15);
##
43
        legstr = (legstr, ['dlobal Naximum')];
        if(numel(minp) -= 0)
        gmin = roos(fvel == min(fvel));
disp(("Global minimum of f(x) occurs at: ',tum2str(gmin),' and its value is: ', num2str(min(fvel)));
plor(gmin,f(gmin),'a*','MarkerSize',10);
49
$0
51
        legstr = [legstr, ('Global Minimum')];
12
        legend(legenz, 'Lonstina', 'Best')
                                                                                                                                                                         14.1 Cd 16
```

```
Command Window

Enter the function f(x):x*3-12*x-5
Enter the interval: [-4 4]
Critical Points of f(x) occurs at: -2
Local maximum of f(x) occurs at: 2
Global maximum of f(x) occurs at: 2
Global maximum of f(x) occurs at: 2 and its value is:11
Global minimum of f(x) occurs at: 2 and its value is:-21

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PROBLEM 4

Find the global extrema of function $f(x) = x^2*e^sinx-x/(x^3+1)$ on interval [0,5].

```
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         plear all
         ±1±
         BYER E
         f = input('finise the function f(s))')z
         I - imput("finter the interval: ");
         a=1(1);b=1(2);
        dt = diff(f,x)/
         mor = miff(af,x);
         f = inline(vectorize(f));
         df = imline(vectorize(df));
        dif = inline(vectorise(dif));
range = linspace(a,b,100);
12
13
         plot(range,f(range),"-0", 'LineWidth', T);
我 甘 は 日 は 日 は 日 は 日 日
         legats * ("Function Fint");
         hold our
         guesses = linspace(a,b,5);
         root * merus(size(guesses));
      Offici-linumel(guesses)
         root(1) - frero(df, guesses(1)):
        toof * toot|# <* toot # tont <*#)/
         root = unique(round(root,4));
         plot(root, f(root), 'ro', 'MarkerSire', 10);
        legstr = [legstr, ['Critical Points']];
disp(['Critical Points of f(M) Are) ', num2str[root)])
25 26 27 29 29 30 31 32
         maxp = root(ddf(root) < 0);
         minp * most(ddf(most) > 0);
fwal * f(most);
        if(mamel(mamp) -= 0)
        quas = cos(fral = max(fval));

disp(['Olobel maximum of f(x) boogre at (',max]str(quas),' and its value is (', max]str(max(fval))])

<math>plot(quas, f(quax), 'm-', 'Markerfire', 10);
32
         plot(gmax,f(gmax),'m-','MarkerSize',10):
33
         legatz * [legatz, ('Global Hawlmum')];
34
35
36
37
         if thuse I mamp: -= 0)
         gmin = root(fval == min(fval));
         disp[['Global minimum of f(s) occurs at) ',numletr(gmin),' and its value is) ', numletr(min(fval))])
         plot(gmin, f(gmin), 'm'', 'Narkwrdine', 10);
32
37
41
         legate = [legate, ('Global Minimum')];
         legend(legets, 'Location', 'Best')
```

```
Enter the function f(x):x*2*exp(sin(x)) - x/(x*3+1)
Enter the interval: [0 5]
Critical Points of f(x) are: 0.2953 2.5092 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
$\frac{6}{2} >> \bigcircle{1}$
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