Finding the Tangent of a point

```
clc; clear
all; syms
x;
y = input('Enter the function f in terms of x: ');
x1 = input('Enter x value at which tangent is to be found: ');
D = [x1-2 x1+2]; ezplot(y,D); hold on;
yd = diff(y,x); %diff defretiats the function diff(function,independent varibale w.r.t) slope =
subs(yd,x,x1); %subs subitues the value subs(function,point of sub, value to be put) y1 =
subs(y,x,x1); plot(x1,y1,'ko'); hold on;
Tgtline = slope*(x-x1)+y1;
ezplot(Tgtline,D);
```

Plotting using Subplot

```
clc; clear
all;
x = 0 : 0.1 : 2 * pi; % Same as linspace format start:increment:stop
subplot(2,2,1); plot(x,sin(x)); title('sin(x)');  subplot(2,2,2);
plot(x,cos(x),'r');
title('cos(x)');
subplot(2,2,3); plot(x,exp(-
x),'g'); title('e^-^x');
subplot(2,2,4);
plot(x,sin(3*x),'m');
title('sin(3x)');
```

Plotting using ezplot

```
clc; clear
all; syms
x;
f = sin(2*x) + cos(3*x);
figure(1); ezplot(f);
figure(2);
ezplot(f,[0,3]);
```

Plotting the Maxima and Minima of a function

```
clc; clear
all; syms x
real;
f = input('Enter the function f(x): ');
fx = diff(f,x); fxx =
diff(fx,x); c =
solve(fx); c =
```

```
double(c); for i = 1:
length(c)    T1 =
subs(fxx,x,c(i))
   T1 = double(T1)
   T3 = subs(f,x,c(i))
T = double(T3)     if
(T1 == 0)
      sprintf('The inflection point is x = %d',c(i));
else
      if (T1 < 0)
         sprintf('The maximum point x is %d',c(i));
         sprintf('The maximum value of the function is %d',T3)
else
         sprintf('The minimum point x is %d',c(i));
         sprintf('The minimum value of the function is %d',T3)
end    end
   plot(c(i),T3,'g*','markersize',15)
hold on; end cmin = min(c); cmax
= max(c); D = [cmin-2, cmax+2]
ezplot(f,D);
```

Plotting the graph and its derivatives

```
clc; clear
all; syms x
real;
f = input('Senter the function f(x): ');
fx = diff(f,x);
fxx = diff(fx,x);
D = [0,5]; l =
ezplot(f,D);
set(l,'color','b');
hold on; h =
ezplot(fx,D);
set(h,'color','r');
e = ezplot(fxx,D);
set(e,'color','g');
legend('f','fx','fxx
');
legend('Location
','northeastoutsi
de')
```

Plotting a circle

```
% Clear Command Window
clc;
% Clear workspace
```

```
clear all; syms
r a b;
r = input('Enter the radius of the circle: '); a =
input('Enter the x co-ordinate of center: '); b =
input('Enter the y co-ordinate of center: '); t =
linspace(0,2*pi,100);
% x-a = rcos(t) [parametric form] => x = a+r*cos(t)
x = a + r*cos(t);
% y-b = rsin(t) [parametric form] => y = b+r*sin(t)
y = b + r*sin(t);
axis equal; % for same number of points in x and y axis'
plot(x,y); % ploting graph xlabel('x-Coordinate');
ylabel('y-Coordinate');
title('(x-a)^2 + (y-b)^2 = r^2');
```

Plotting multiple graphs on the same graph

```
clc; clear all x =
linspace(0,1,100);
plot(x,x.^2,'r','LineWidth',2.0)
hold on
plot(x,cos(x),'g','LineWidth',2.0')
hold on
plot(x,sin(x),'b','LineWidth',2.0) hold
on plot(x,exp(x),'c','LineWidth',2.0)
hold on
plot(x,sin(x.^3),'y','LineWidth',2.0)
legend('x^2','cos(x)','sin(x)','exp(x)','sin(x^3)')
```

Maxima and Minima for double Variable

```
clc;
clear all;
syms x y
f(x,y) = input('Enter a function f(x,y): ');
fx = diff(f,x); fy = diff(f,y);
[cx, cy] = solve(fx,fy);
cx = double(cx); cy = double(cy);
fxx = diff(fx,x); fyy = diff(fy,y); fxy = diff(fx,y);
D = fxx * fyy - fxy ^ 2;
figure;
fsurf(f);
legstr = {'Function Plot'};
for i = 1 : length(cx)
   T1 = D(cx(i), cy(i))
   T2 = fxx(cx(i), cy(i))
   T3 = f(cx(i), cy(i))
   if (double(T1) == 0)
      splrintf('At (%f,%f) further investigation is required',cx(i),cy(i))
      legstr = [legstr, {'Case of Further Investigation'}];
```

```
      mkr = 'ko';
   elseif (double(T1) < 0)
      sprintf('The point (%f,%f) is a saddle point', cx(i), cy(i))
      legstr = [legstr, {'Saddle Point'}];
      mkr = 'bv';
   else
      if (double(T2) < 0)
         sprintf('The maximum value of the function is f(%f,%f) =
%f', cx(i), cy(i), T3)
         legstr = [legstr, {'Maximum Value of the function'}];
         mkr = 'g+';
      else
         sprintf('The minimum value of the function is f(%f,%f) =
%f', cx(i), cy(i), T3)
         legstr = [legstr, {'Minimum Value of the function'}];
         mkr = 'r*';
      end
   end
   hold on;
   plot3(cx(i), cy(i), T3, mkr,'LineWidth',4);
end
legend(legstr,'Location','best')
```

Area Under Curve

```
clc
clear
syms x
y1=input('ENTER the upper curve as a function of x : ');
y2=input('ENTER the lower curve as a function of x : ');
t=solve(y1-y2);
 t=double(t);
 A=int(y1-y2,t(1),t(2))
D=[t(1)-0.2 t(2)+0.2];
ez1=ezplot(y1,D);
set(ez1,'color','r')
hold on
ez2=ezplot(y2,D);
set(ez2,'color','g')
xv = linspace(t(1),t(2));
y1v =subs(y1,x,xv);
y2v = subs(y2,x,xv);
x = [xv,xv];
y = [y1v,y2v];
fill(x,y,'b')
```