VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Lab Assessment - 1

Fall Semester 2021-22

MAT1011: Calculus for Engineers

L41+L42

By

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Question - 1

Using MATLAB, find the tangent of the curve $y=3+x^2$ at x=2 and show it graphically

Code

```
clc

clear all

close all

syms x y h;

f = input ('Enter the function: ');

x0 = input ('Enter the X coordinate: ');

ezplot(f)

hold on

y0 = subs (f,x0);

L = limit (f,x,x0,'left');

R = limit (f,x,x0,'right');
```

```
if L == R && L == y0
      disp ('Function is continuous… ');
      fRHD = limit ((subs(f,x0 + h) -
subs(f,x0))/h,h,0);
      fLHD = limit ((subs(f,x0 - h) -
subs(f,x0))/-h,h,0);
      if fRHD == fLHD
      disp ('Function is differentiable… ');
      m = subs (diff(f),x,x0);
      tangent = y0 + m*(x-x0);
      ezplot(tangent)
      title('Tangent Line')
      grid on
      hold off
      else
      disp ('Function is not differentiable… ');
      end
```

```
allen = sprintf('Tangent of y = %s at (%d,%d) is
y = %s\n',f,x0,y0,tangent);
disp (allen)
end
```

Console

Command Window

```
Enter the function: 3+x^2
Enter the X coordinate: 2
Function is continuous...
Function is differentiable...
Tangent of y = x^2 + 3 at (2,7) is y = 4*x - 1

fx >>
```

Output

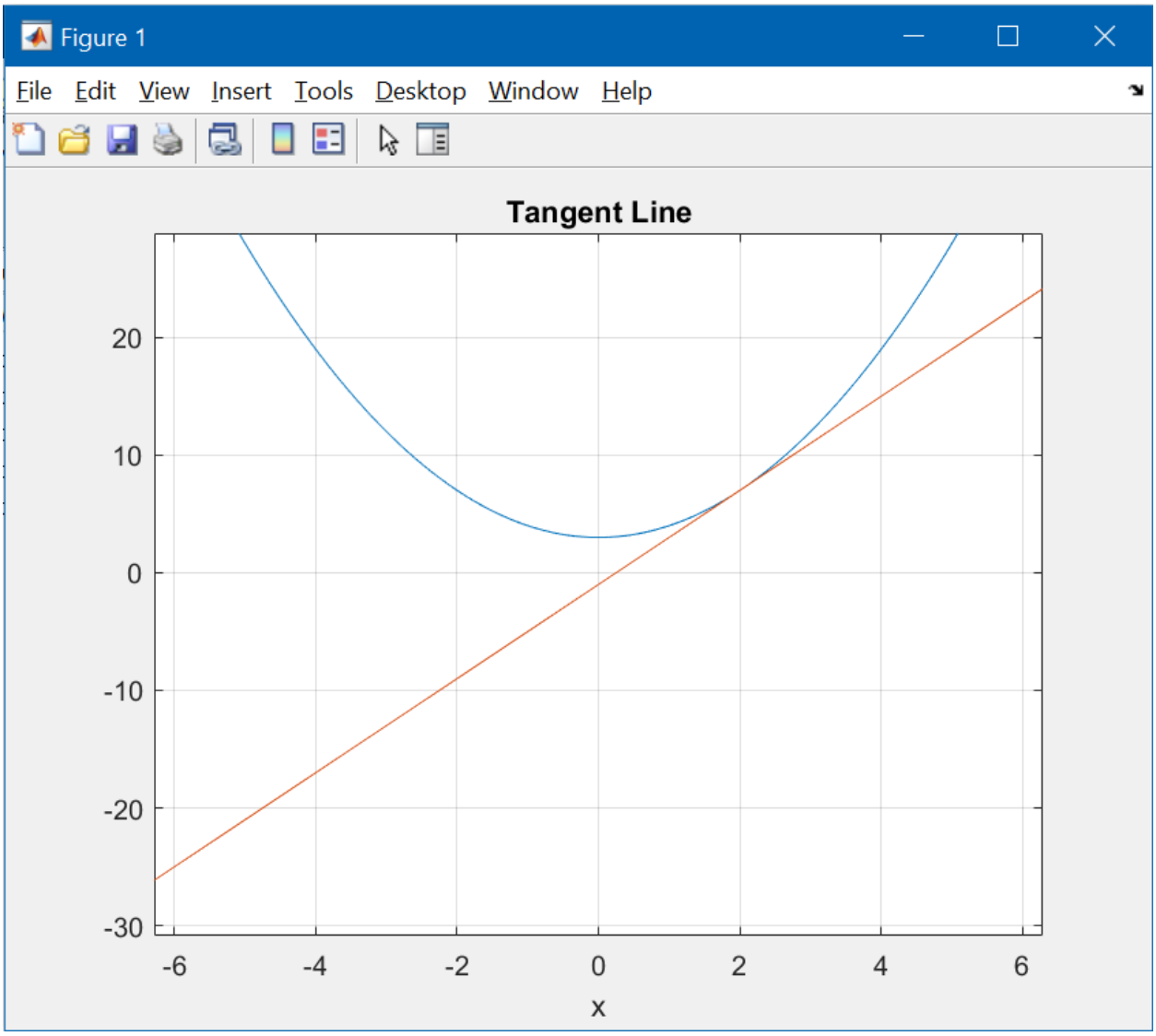
Figure 1
File Edit View Insert Tools Desktop Window Help
Tangent Line
20
10
0
-10
-20
-30
-6
-4
-2
0
2
4
6
x

Question - 2

Verify the Rolle's theorem for the function $(x-2)^2\,(x+1)^3$ in [-1, 2]. Plot the curve along with the secant joining the endpoints and the tangents at points which satisfy Rolle's theorem

Code

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close all

syms x y h;

f = input ('Enter the function: ');

x0 = input ('Enter the X coordinate: ');

ezplot(f)

hold on
```

```
y0 = subs (f,x0);
L = limit (f,x,x0,'left');
R = limit (f,x,x0,'right');
if L == R && L == y0
     disp ('Function is continuous… ');
     fRHD = limit ((subs(f,x0 + h) -
subs(f,x0))/h,h,0);
     fLHD = limit ((subs(f,x0 - h) -
subs(f,x0))/-h,h,0);
     if fRHD == fLHD
     disp ('Function is differentiable… ');
     m = subs (diff(f),x,x0);
     tangent = y0 + m*(x-x0);
     ezplot(tangent)
     title('Tangent Line')
     grid on
     hold off
     else
```

```
    disp ('Function is not differentiable… ');
    end
allen = sprintf('Tangent of y = %s at (%d,%d) is
y = %s\n',f,x0,y0,tangent);
disp (allen)
end
```

Console

Command Window

```
Enter the function: 3+x^2
Enter the X coordinate: 2
Function is continuous...
Function is differentiable...
Tangent of y = x^2 + 3 at (2,7) is y = 4*x - 1

fx >>
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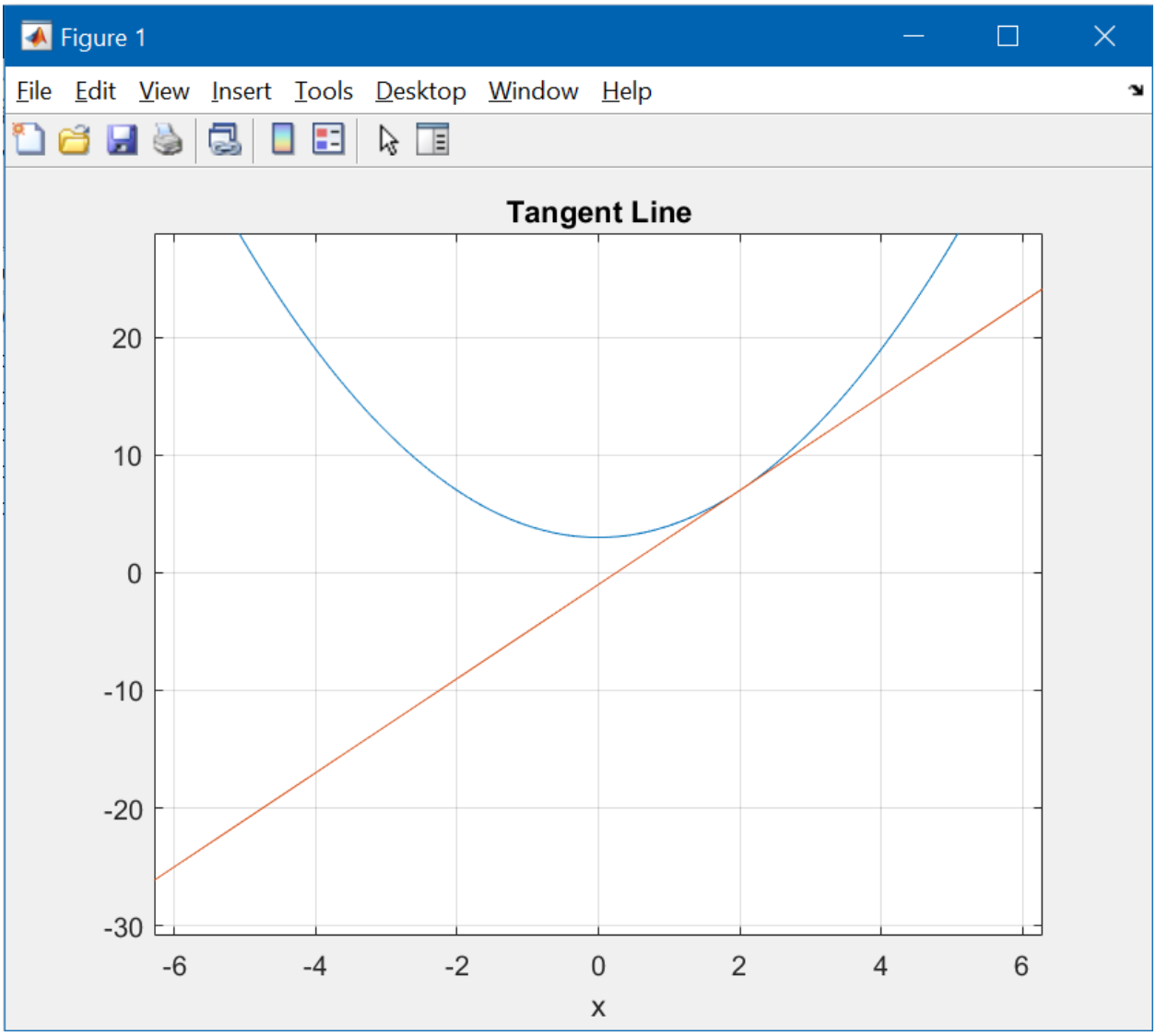
Output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x

Question - 3

Find the local and global maxima and minima for the function $f(x)=x^2+3x+4$ in the interval [-3, 3] using MATLAB

Code

```
clc

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close all

syms x y h;

f = input ('Enter the function: ');

x0 = input ('Enter the X coordinate: ');

ezplot(f)

hold on

y0 = subs (f,x0);
```

```
L = limit (f,x,x0,'left');
R = limit (f,x,x0,'right');
if L == R && L == y0
     disp ('Function is continuous… ');
     fRHD = limit ((subs(f,x0 + h) -
subs(f,x0))/h,h,0);
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subs(f,x0))/-h,h,0);
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     tangent = y0 + m*(x-x0);
     ezplot(tangent)
     title('Tangent Line')
     grid on
     hold off
     else
     disp ('Function is not differentiable… ');
```
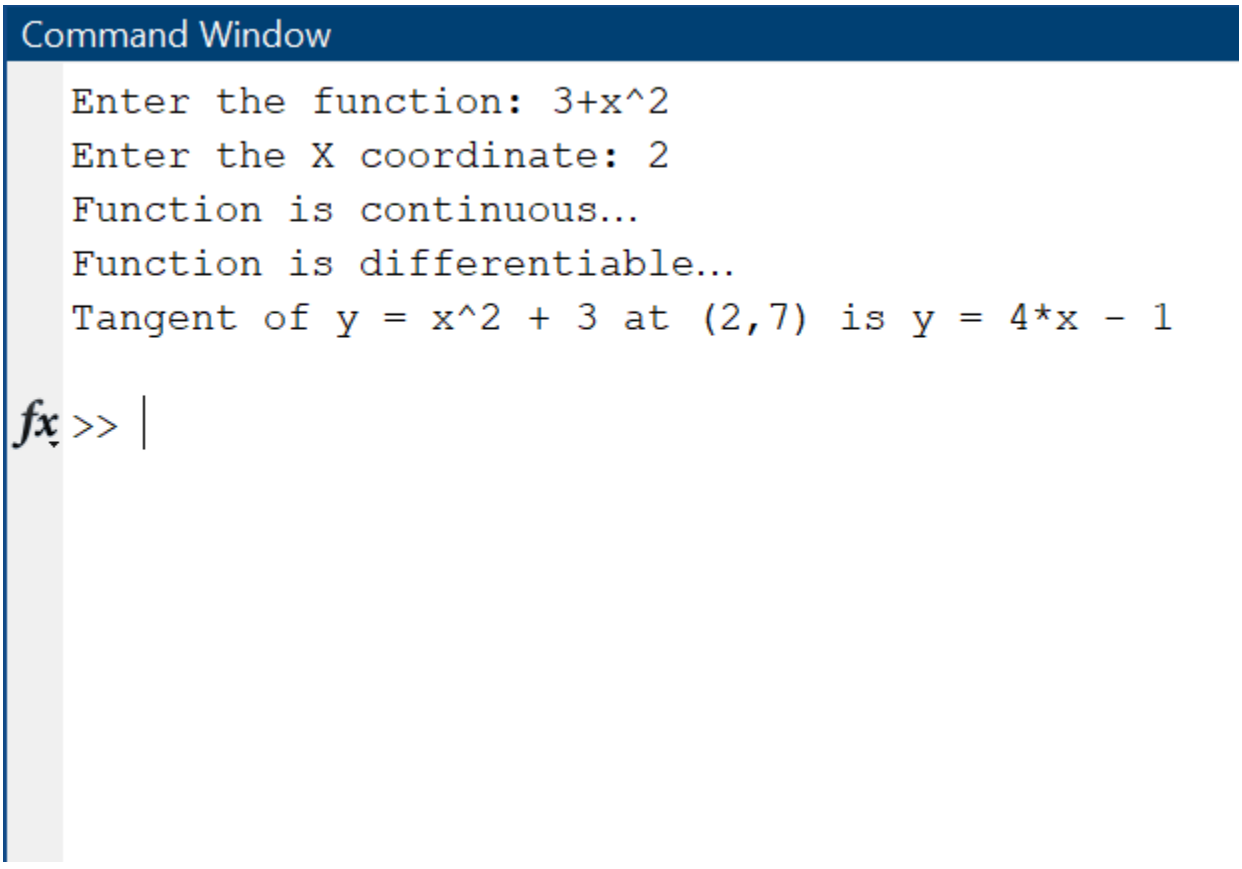
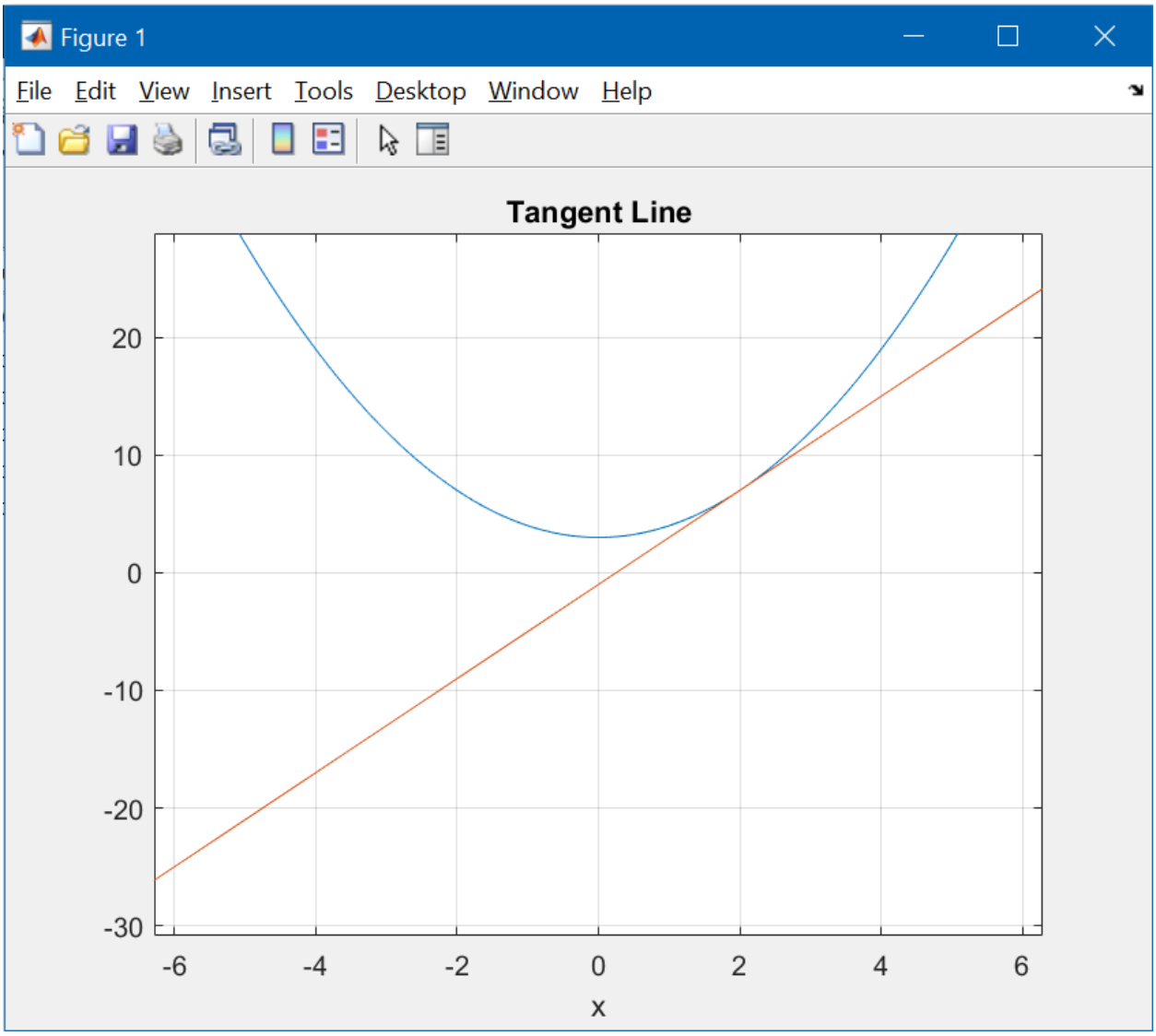

```
    end
allen = sprintf('Tangent of y = %s at (%d,%d) is
y = %s\n',f,x0,y0,tangent);
disp (allen)
end
```

Console



Output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