ASSIGNMENT:-2

EECE:-212

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Level: 2

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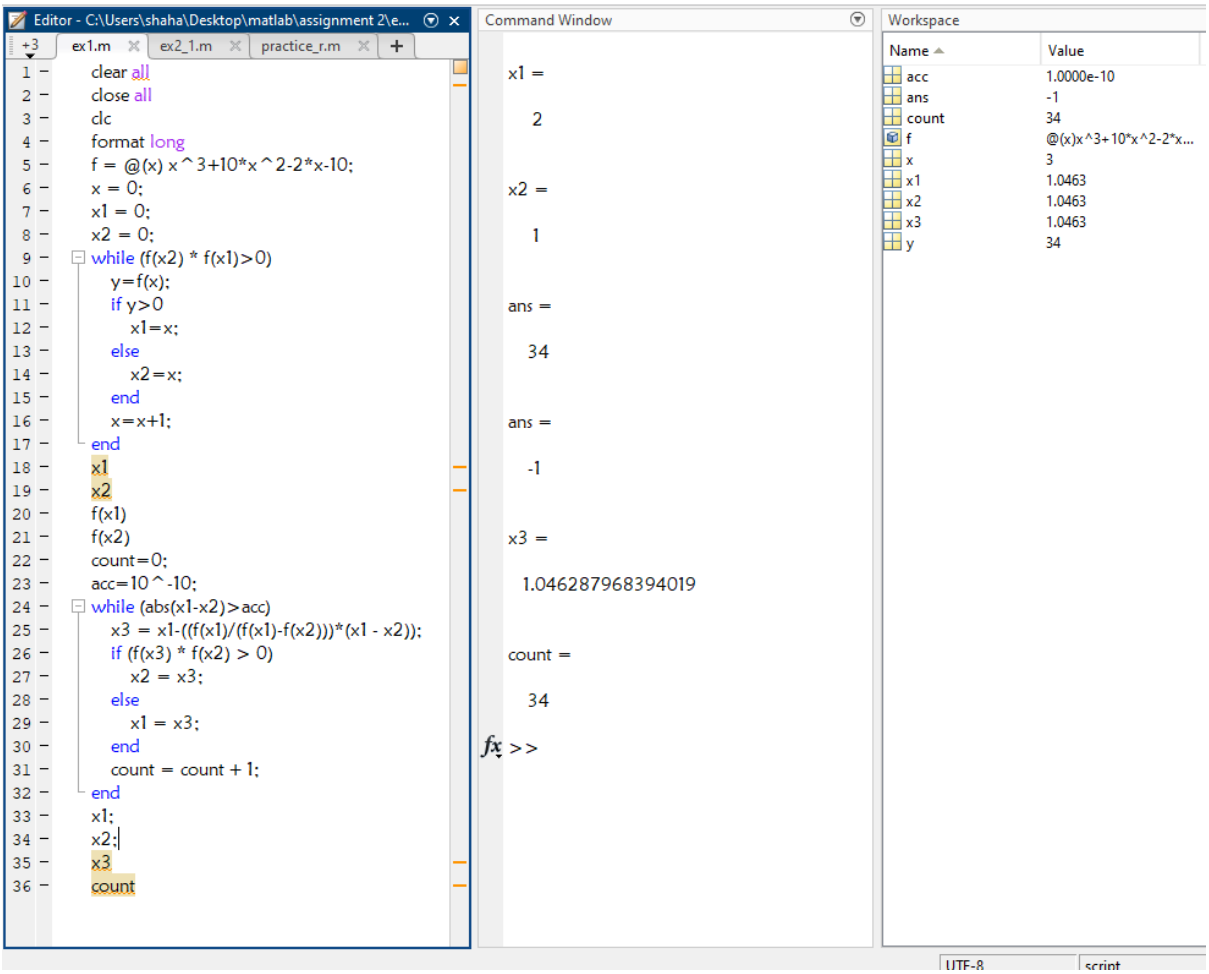
Here are some mathematical problem are solved by MATLAB 2020a.according to the questions. The answers are given bellow:

1. Write a MATLAB programs to find a real root of the following equation f(x) =x^3+10x^2-2x-10 by the Method of False Position. Use an accuracy level correct to 10 decimal place. Also find the number of iteration to achieve this accuracy.

Solution:

Here is a function **f(x) =x^3+10x^2-2x-10,** have to be solved by method of False position and used an accuracy level correct to 10 decimal place. Also find the number of iteration to achieve this accuracy.



Here the solution is: **1.046287968394019**

Number of iterations: **34**

2. Plot the values of x calculated in each iteration from the False Position Method's equation. (For this problem, you should store the calculated value of x in an array, then use that array to plot the curve)

Solution:

Here have to Plot the values of x calculated in each iteration from the False Position Method's equation.

```
clear all
close all
clc
format long
f = @(x) x^3+10*x^2-2*x-10;
x = 0;
x1 = 0;
x2 = 0;
while (f(x2) * f(x1)>0)
    y=f(x);
    if y>0
        x1=x;
    else
        x2=x;
    end
    x=x+1;
end
x1;
x2;
count=0;
acc=10^-10;
while (abs(x1-x2)>acc)
    x3 = x1-((f(x1)/(f(x1)-f(x2)))*(x1 - x2));
    if f(x3) * f(x2) > 0)
        x2 = x3;
    else
        x1 = x3;
    end
    count = count + 1;
    graph(count)=x3;
end
x1;
x2;
x3;
count;
graph
plot(graph)
```

```
graph =

  Columns 1 through 4

   1.028571428571428   1.039570170179403   1.043749801661508   1.045330280942723

  Columns 5 through 8

   1.045926804185185   1.046151792081000   1.046236627107945   1.046268612200073

  Columns 9 through 12

   1.046280670985132   1.046285217234967   1.046286931195051   1.046287577365699

  Columns 13 through 16

   1.046287820974749   1.046287912816358   1.046287947441017   1.046287960494653

  Columns 17 through 20

   1.046287965415926   1.046287967271266   1.046287967970737   1.046287968234440

  Columns 21 through 24

   1.046287968333857   1.046287968371338   1.046287968385468   1.046287968390795

  Columns 25 through 28

   1.046287968392804   1.046287968393561   1.046287968393846   1.046287968393954

  Columns 29 through 32

   1.046287968393995   1.046287968394010   1.046287968394016   1.046287968394018

  Columns 33 through 34

   1.046287968394019   1.046287968394019

fx >>
```

Name	Value
acc	1.0000e-10
count	34
f	@(x)x^3+10*x^2-2*x...
graph	1x34 double
x	3
x1	1.0463
x2	1.0463
x3	1.0463
y	34

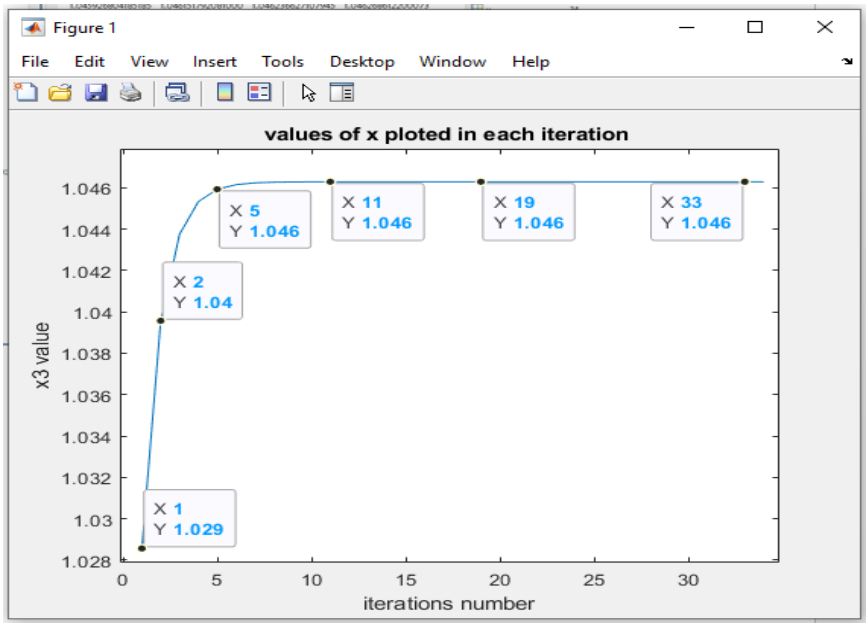


Figure 1: the values of x vs Number of iterations

3. Find a real root of the above function using False Position Method by hand Calculation. Show the first three iteration.

Solution:

Here we have to find out the real roots of the function using false position method by hand calculations. The first three iterations are shown:

The function is:

x^3+10*x^2-2*x-10

From the previous program we have got that,

The upper value is, x1 = 2,

For which the function gets the positive value.

Which is **f(x1) = 34**

The lower value is, x2 = 1,

Which is f**(x2) = -1**

For which the function gets the negative value.

The false position method programing is:

```
while (abs(x1-x2)>acc)
   x3 = x1-((f(x1)/(f(x1)-f(x2)))*(x1 - x2))
   if (f(x3) * f(x2) > 0)
      x2 = x3;
   else
      x1 = x3;
   end
   count = count + 1;
end
```

According to **false position method:**

1st iteration:

$$x3 = x1 - \frac{f(x1)}{f(x1) - f(x2)} * (x1 - x2)$$

Or,

$$x3 = 2 - \frac{34}{34 - (-1)} * (2 - 1)$$
$$= 1.028571428571428$$

Now in the loop:

f(x3)= -0.3893644315 , f(x2)= -1

f(x3)*f(x2)>0

so according to loop

x2=x3;

that means **x2 = 1.028571428571428**

and so now **f(x2)= -0.3893644315**

now in the

2nd iteration :

$$x3 = x1 - \frac{f(x1)}{f(x1) - f(x2)} * (x1 - x2)$$

Or,

$$x3 = 2 - \frac{34}{34-(-0.3893644315)} * (2 - 1.028571428571428)$$

$$= 1.039570170179403$$

Now in the loop:

f**(x3)= -0.1486090885, f(x2)= -0.3893644315**

f(x3)*f(x2)>0

so according to loop

x2=x3;

that means **x2 = 1.039570170179403**

and so now **f(x2)= -0.1486090885**

now in the 3rd iteration :

$$x3 = x1 - \frac{f(x1)}{f(x1) - f(x2)} * (x1 - x2)$$

Or,

$$x3 = 2 - \frac{34}{34-(-0.1486090885)} * (2 - 1.039570170179403)$$

$$= 1.043749801661508$$

So, finally the 3 iterations are:

1. 1.028571428571428
2. 1.039570170179403
3. 1.043749801661508