INDIAN INSTITUTE OF TECHNOLOGY GANDHINAGAR

MA 202: MATHEMATICS - IV
Semester–II, Academic Year 2022-23

Tutorial Set -2
Question - 3

By

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➔ In question 3, we are asked to find the least positive root of the given equation using the Secant method. Approximation after the (i+1)th iteration, Secant method, as we know, is given by:

$$x(i+1) = x(i) - \left[\frac{f(x(i-1)) \times (x(i)-x(i-1))}{f(x(i))-f(x(i-1))}\right]$$

➔ Here, we need two initial guesses from the user. Initially, after taking the input form the user, the input value goes into the function in which firstly the value of the function at that guessing point is calculated. Then, the iteration formula of the

Secant method as shown above runs and it will run and find all the values until the error will be smaller than the tolerance.

```
% SUBMITTED BY - KUSH PATEL (20110131)
% Question -3
% Create a fuunction to call the value of xi_1 and xi and return the vale of x_r
function [x_r] = T23_20110131(xi_1,xi)
% to print the value of x_r up to long decimal digits
format("long")
% Initialize the vales of tolerance and error
err = 1000;
tol = 0.000000001;
% Run the while loop to run the iterations
while err > tol
    f1 = Func(xi_1);
    f2 = Func(xi);
    x_r = xi - ((f2 * (xi - xi_1))/((f2 - f1)));
    err = abs((x_r - xi)/xi);
    xi_1 = xi;
    xi = x_r;
end
% Create the function to find the given function value
function val = Func(x)
val = (7 * exp(-x) * sin(x)) - 1;
end
end
```

Code of the Secant Method

```
>> [x_r] = T23_20110131(0.5,0.4)

x_r =

   0.170179993753835

>>
```

Simulated output

➔ Here, my tolerance is very small; it means the loop will run many times upto large iterations so that we can get the more accurate root upto large decimal places which is same as the correct answer as shown in below graph.

➔ Root finding after plotting :