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Math 131-05D

Homework #4 2a secant

1. a) interval [-2,1]

b)

Interval [-1, 0]

The code uses secant method to find roots of a function up to a tolerance of within 100 iterations and graph the logarithmic error. For function (a) the code found the root to be at -1.4145 with 32 iterations with an order of convergence of 1. For function (b) the root was found to be -0.18330 this was found with 31 iterations with an order of convergence of 1.0245.

**Matlab Output:**

>> secantmethod

=======

number of iterations to solve function a:

32

the root for function a is located at:

-1.4145

the order of convergence for function a is:

1

=======

number of iterations to solve function b:

31

the root for function b is located at:

-0.18330

the order of convergence for function b is:

1.0245

**Matlab code used for this problem:**

%==========================================================

%Name: Yeash Patel

%Class: Math131-Numerical Analysis-05D-SP17

%Title: HW4

%

%problem 2 secantmethod method for a and b

%

%problem 3

% newtons is quadratic and requires the deriviative of the

% function also takes less iterations.

%

% Secant does not require the derivative of the function and

% therfore less function evaluations.

%

%==========================================================

close all

clc

clear all

a=@(x)cos(x+sqrt(2))+x\*(x/2+sqrt(2));

b=@(z)exp(6\*z)+3\*((log(2))^2)\*exp(2\*z)-log(8)\*exp(4\*z)-(log(2))^3

N=100;

TOL=10^-5;

i=1;

t=1;

x=-2;

x1=-1.5;

err=[];

errb=[];

z=-1

z1=-0.999

while(i<=N)

xn(i)=x1-(a(x1)\*(x1-x))/(a(x1)-a(x))

err(i)=abs(xn(i)-x1)

if(err(i)<=TOL||err(i)==0)

disp(i)

disp(x)

break;

end

x=x1

x1=xn(i)

i++

end

while(t<=N)

zn(t)=z1-(b(z1)\*(z1-z))/(b(z1)-b(z))

errb(t)=abs(zn(t)-z1)

if(errb(t)<=TOL||errb(t)==0)

disp(t)

disp(z)

break;

end

z=z1

z1=zn(t)

t++

end

u=length(err)-1

n=length(errb)

aa=log(err(2:u))./log(err(1:u-1))

ab=log(errb(2:n))./log(errb(1:n-1))

disp('=======')

disp('number of iterations to solve function a:')

disp(i)

disp('the root for function a is located at:')

disp(x)

disp('the order of convergence for function a is:')

disp(aa(u-1))

disp('=======')

disp('number of iterations to solve function b:')

disp(t)

disp('the root for function b is located at:')

disp(z)

disp('the order of convergence for function b is:')

disp(ab(n-1))

subplot(1,2,1)

loglog(errb(2:u),err(1:u-1),'\*-')

axis on

title("secant method error for a")

xlabel('number of iteration')

ylabel('log(error)')

subplot(1,2,2)

loglog(errb(2:n),errb(1:n-1),'\*-')

axis on

title("secant method error for b")

xlabel('number of iteration')

ylabel('log(error)')