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ASSIGNMENT #1

COMPUTATIONAL METHOD I

GROUP MEMBERS (GR-3)

MEHDI RAZA RAJANI k163904

TAHIR RAZA HEMANI K163905

MOazzam Muqsood k163868

M AMMAR RIZWAN K163862

Bisection Method:

## **MATLAB CODE:**

format short;

str=input('Type the equation in terms of x: ','s');

a=input('Enter the first interval:\n');

f=inline(str,'x');

valA=feval(f,a);

b=input('Enter the second interval:\n');

valB=feval(f,b);

TOL=input('Enter the value of TOL:\n');

check = true;

if abs(valA) <= TOL

fprintf('f(%f) = %f\n',a,valA);

display('Succeeded');

check = false;

elseif abs(valB) <= TOL

fprintf('f(%f) = %f\n',b,valB);

display('Succeeded');

check = false;

elseif not((valA>0 && valB<0)||(valB>0 && valA<0))

display('Answer is not in the given rannge');

check = false;

end

n = 1;

while check

error = abs(a-b)/2^n;

n = n+1;

if error <= TOL

fprintf('ANS f(%f) = %f\n',c,valC);

display('suceeded');

check = false;

end

fprintf('f(%f) = %f\tf(%f) = %f\t\t\terror = %f\n',a,valA,b,valB,error);

c = (a + b)/2;

valC=feval(f,c);

if abs(valC) <= TOL

fprintf('ANS f(%f) = %f\n',c,valC);

display('Succeeded');

check = false;

elseif valC > 0

if valA > 0

a = c;

valA = valC;

else

b = c;

valB = valC;

end

else

if valA < 0

a = c;

valA = valC;

else

b = c;

valB = valC;

end

end

end

## **OUTPUT OF THE PROGRAM:**

>> bisectionMethod

Type the equation in terms of x: log(x-1) + cos(x-1)

Enter the first interval:

1.3

Enter the second interval:

2

Enter the value of TOL:

0.000001

f(1.300000) = -0.248636 f(2.000000) = 0.540302 error = 0.350000

f(1.300000) = -0.248636 f(1.650000) = 0.365301 error = 0.087500

f(1.300000) = -0.248636 f(1.475000) = 0.144852 error = 0.021875

f(1.387500) = -0.022183 f(1.475000) = 0.144852 error = 0.005469

f(1.387500) = -0.022183 f(1.431250) = 0.067377 error = 0.001367

f(1.387500) = -0.022183 f(1.409375) = 0.024246 error = 0.000342

f(1.387500) = -0.022183 f(1.398438) = 0.001464 error = 0.000085

f(1.392969) = -0.010249 f(1.398438) = 0.001464 error = 0.000021

f(1.395703) = -0.004365 f(1.398438) = 0.001464 error = 0.000005

f(1.397070) = -0.001444 f(1.398438) = 0.001464 error = 0.000001

f(1.397070) = -0.001444 f(1.397754) = 0.000012 error = 0.000000

ANS f(1.397754) = 0.000012

suceeded

REGULAR FALSI METHOD:

## **MATLAB CODE:**

format short;

str=input('Type the equation in terms of x: ','s');

a=input('Enter the first interval:\n');

f=inline(str,'x');

valA=feval(f,a);

b=input('Enter the second interval:\n');

valB=feval(f,b);

TOL=input('Enter the value of TOL:\n');

check = true;

if abs(valA) <= TOL

fprintf('f(%f) = %f\n',a,valA);

display('Succeeded');

check = false;

elseif abs(valB) <= TOL

fprintf('f(%f) = %f\n',b,valB);

display('Succeeded');

check = false;

elseif not((valA>0 && valB<0)||(valB>0 && valA<0))

display('Answer is not in the given rannge');

check = false;

end

while check

error = abs(a-b);

if error <= TOL

fprintf('ANS f(%f) = %f\n',c,valC);

display('suceeded');

check = false;

end

fprintf('f(%f) = %f\tf(%f) = %f\t\t\terror = %f\n',a,valA,b,valB,error);

c = (a\*valB-b\*valA)/(valB-valA);

valC = feval(f,c);

if abs(valC) <= TOL

fprintf('ANS f(%f) = %f\n',c,valC);

display('Succeeded');

check = false;

elseif valC > 0

if valA > 0

a = c;

valA = valC;

else

b = c;

valB = valC;

end

else

if valA < 0

a = c;

valA = valC;

else

b = c;

valB = valC;

end

end

end

## **OUTPUT OF THE PROGRAM:**

>> regularFalsiMethod

Type the equation in terms of x: log(x-1) + cos(x-1)

Enter the first interval:

1.3

Enter the second interval:

2

Enter the value of TOL:

0.000001

f(1.300000) = -0.248636 f(2.000000) = 0.540302 error = 0.700000

f(1.300000) = -0.248636 f(1.520607) = 0.214758 error = 0.220607

f(1.300000) = -0.248636 f(1.418368) = 0.042359 error = 0.118368

f(1.300000) = -0.248636 f(1.401138) = 0.007166 error = 0.101138

f(1.300000) = -0.248636 f(1.398304) = 0.001181 error = 0.098304

f(1.300000) = -0.248636 f(1.397840) = 0.000194 error = 0.097840

f(1.300000) = -0.248636 f(1.397763) = 0.000032 error = 0.097763

f(1.300000) = -0.248636 f(1.397751) = 0.000005 error = 0.097751

ANS f(1.397749) = 0.000001

Succeeded

FIXED POINT METHOD:

## **MATLAB CODE:**

format short;

str=input('Type the equation in terms of x: ','s');

y=input('Enter the initial guess:\n');

f=inline(str,'x');

val=feval(f,y);

TOL=input('Enter the value of TOL:\n');

check = true;

val=feval(f,y);

if val == 0;

fprintf('f(%f) = %f\n',y,val);

display('Succeeded');

check = false;

end

while check;

newVal = feval(f,val);

if abs(val) <= TOL;

fprintf('ANS = %f\n',val);

display('Succeeded');

break;

end

error = abs((val-newVal)/val);

fprintf('f(%f) = %f\t\terror = %f\n',val,newVal,error);

if val == newVal

fprintf('ANS = %f\n',val);

display('succedded');

break;

elseif error < TOL;

fprintf('ANS = %f\n',val);

display('succedded');

break;

end

val = newVal;

end

## **OUTPUT OF THE PROGRAM:**

>> fixedPointMethod

Type the equation in terms of x: exp(-cos(x-1)) + 1

Enter the initial guess:

1.3

Enter the value of TOL:

0.000001

f(1.384683) = 1.395772 error = 0.008008

f(1.395772) = 1.397445 error = 0.001199

f(1.397445) = 1.397702 error = 0.000184

f(1.397702) = 1.397741 error = 0.000028

f(1.397741) = 1.397747 error = 0.000004

f(1.397747) = 1.397748 error = 0.000001

ANS = 1.397747

Succedded

NEWTON-RAPHSON METHOD:

## **MATLAB CODE:**

format short;

str=input('Type the equation in terms of x: ','s');

str1=input('Type the derivative of equation in terms of x: ','s');

y=input('Enter the initial guess:\n');

f=inline(str,'x');

df=inline(str1,'x');

valA=feval(f,y);

TOL=input('Enter the value of TOL:\n');

check = true;

val = feval(f,y);

if abs(val) <= TOL;

fprintf('f(%f) = %f\n',y,val);

display('Succeeded');

check = false;

end

if check

fprintf('f(%f) = %f\n',y,val);

end

while check;

valY = feval(f,y);

valD = df(y);

newY = y - valY/valD;

newVal = feval(f,newY);

if abs(newVal) <= TOL

fprintf('ANS = %f\n',newY);

display('Succeeded');

break;

end

error = abs((y-newY)/y);

fprintf('f(%f) = %f\t\terror = %f\n',newY,f(newY),error);

y = newY;

if error <= TOL

fprintf('ANS = %f\n',newY);

display('succedded');

break;

end

end

## **OUTPUT OF THE PROGRAM:**

>> newtonRaphsonMethod

Type the equation in terms of x: log(x-1) + cos(x-1)

Type the derivative of equation in terms of x: 1/(x-1) - sin(x-1)

Enter the initial guess:

1.3

Enter the value of TOL:

0.000001

f(1.300000) = -0.248636

f(1.381847) = -0.034757 error = 0.062959

f(1.397321) = -0.000910 error = 0.011198

ANS = 1.397748

Succeeded

SECANT METHOD:

## **MATLAB CODE:**

format short;

str=input('Type the equation in terms of x: ','s');

y0=input('Enter the first interval:\n');

f=inline(str,'x');

val0=feval(f,y0);

y1=input('Enter the second interval:\n');

val1=feval(f,y1);

TOL=input('Enter the value of TOL:\n');

check = true;

if val0 == 0;

fprintf('f(%f) = %f\n',y0,val0);

display('Succeeded');

check = false;

end

if not(check) && val1 == 0;

fprintf('f(%f) = %f\n',y1,val1);

display('Succeeded');

check = false;

end

error = abs((y0-y1)/y0);

if not(check) && error <= 0.00001 ;

fprintf('f(%f) = %f\n',y1,val1);

display('Succeeded');

check = false;

end

if check

fprintf('f(%f) = %f\n',y0,val0);

fprintf('f(%f) = %f\n',y1,val1);

end

while check;

temp = (y0\*val1-y1\*val0)/(val1-val0);

y0 = y1;

y1 = temp;

val0 =val1;

val1 = feval(f,temp);

if abs(val1) <= TOL;

fprintf('ANS = %f\n',y1);

display('succeeded');

break;

end

error = abs((y0-y1)/y0);

fprintf('f(%f) = %f\t\terror = %f\n',y1,val1,error);

if error <= TOL;

fprintf('ANS = %f\n',y1);

display('succeeded');

break;

end

end

## **OUTPUT OF THE PROGRAM:**

>> secantMethod

Type the equation in terms of x: log(x-1) + cos(x-1)

Enter the first interval:

1.3

Enter the second interval:

2

Enter the value of TOL:

0.000001

f(1.300000) = -0.248636

f(2.000000) = 0.540302

f(1.520607) = 0.214758 error = 0.239696

f(1.204358) = -0.608692 error = 0.207976

f(1.438128) = 0.080304 error = 0.194104

f(1.410882) = 0.027320 error = 0.018946

f(1.396833) = -0.001950 error = 0.009957

f(1.397769) = 0.000044 error = 0.000670

ANS = 1.397749

Succeeded