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/*WAP to find solution of Non-Linear equations by Regula-Falsi Method.*/
#include <iostream>
#include <cmath>
#include <iomanip>
#include <cstring>
#define pi 3.14159265358979323846264338327950288419716939937510
#define e 2.71828182845904523536028747135266249775724709369995
using namespace std;
double y,x;
inline void maths_function(double & x_1,double & x_2)
{
    double y_1,y_2;
    y_1 = 3*x_1+sin(x_1)-pow(e,x_1);//Put your function here
    y_2 = 3*x_2+sin(x_2)-pow(e,x_2);//Put your function here
    x = (y_2*x_1 - y_1*x_2)/(y_2-y_1);
    y = 3*x+sin(x)-pow(e,x);//Put your function here
    cout<<"\t\t"<<setw(9)<<setprecision(9)<<x_1;
    cout<<"\t\t"<<setw(9)<<setprecision(9)<<y_1;
    cout<<"\t\t"<<setw(9)<<setprecision(9)<<x_2;
    cout<<"\t\t"<<setw(9)<<setprecision(9)<<y_2;
    cout<<"\t\t"<<setw(9)<<setprecision(9)<<x;
    cout<<"\t\t"<<setw(9)<<setprecision(9)<<y;
}
int main()
{
    int k,error,counter;
    double x1,x2;
    cout.precision(9);
    while(1)
    {
        counter=0;
        cout<<"\n\t\tREGULA-FALSI METHOD\n\n";
        cout<<"Initial guess (a,b) where f(a) < 0 & f(b) > 0\n";
        cout<<"\nEnter your initial guess (a) : ";
        cin>>x1;
        cout<<"\nEnter your second guess (b) : ";
        cin>>x2;
    }
}

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cout<<"\nEnter tolerance (10^-k)\n";
cout<<"\nEnter k: ";
cin>>k;

cout<<"\n\n*****
*****
*****\n\n";
    error=10;
    cout<<" SN\t\t a"<<"\t\t\t f(a)"<<"\t\t b"<<"\t\t\t
f(b)"<<"\t\t\t c=(f(b).a+f(a).b)/(f(b)-f(a))"<<"\t f(c)\n\n";
    while (error>9)
    {
        cout<<" "<<++counter;
        maths_function(x1,x2);
        cout<<endl<<endl;
        if (y<0)
        {
            x1=x;
        }
        else x2=x;
        error = (int)trunc(abs(y*pow(10,k)));//error is in order of 10^k
    }

cout<<"\n\n*****
*****
*****\n\n";
    }
    return 0;
}

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