Documentation

Group 10

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1 Group Members

1. Dyllan Macharia Wamae SCT211-0511/2021
2. Kevin Ogaba SCT211-0026/2018
3. Precious Anyangu SCT211-0034/2021

2 Introduction

The Regula Falsi is a numerical method for estimating the roots of a polynomial f(x). You can approximate the function with a line using two endpoints [a, b]. The endpoints are joined with a chord; The point where the chord crosses the x-axis is the new "guess" for the root. The appropriate endpoint is updated with the new guess, then the algorithm continues, getting closer to the actual root.

3 Steps

1. Define the function f(x)
2. define the maximum iterations and tolerance
3. Choose the initial guess x0 and x1 such that x0 is less than x1 and the product of f(x0) and f(x1) is less than zero
4. Determine x: x = (x0 * f(x1) - b * f(x1))/ (f(x1) - f(x0))
5. Check whether the product of f(x1) and f(x) is negative or not. If it is negative, then assign x0 = x; if it positive, then assign x1 = x;
6. Check whether the value of f(x) is greater than tolerance or not. If yes, goto step 4, if no, goto step 7
7. Display the root as x

4 Python Implementation

```
import math
def f(x):
    return 2 * x**3 - 2 * x - 5

#Initial values are assumed
a=-100
b=200

#maximum iterations
max_iteration = 100000

#tolerance
tol=1e-6

def regulaFalsi(a, b):
    if f(a) * f(b) >= 0:
        print("a and be are not rightly assumed")
        return -1


    for i in range(max_iteration):

        c = (a * f(b) - b * f(a))/ (f(b) - f(a))
        fc = f(c)
        if abs(fc) < tol:
            return c

        elif f(c) * f(a) < 0:
            b = c
        else:
            a = c
    print("The value of root is : " , '%.6f' %c)

regulaFalsi(a,b)
```

5 Advantages

1. It does not require the derivative calculation
2. The method has the first order rate of convergence i.e It is linearly convergent. It always converges

6 Disadvantages

1. As it is trial and error method in some cases, it may take large time span to calculate the correct root and thereby slowing down the process

2. It is used to calculate only a single unknown in the equation.