Bisection and Newton Method

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1 Introduction

The root of the function x^4+8x^2-9 has been found using both Bisection Method and Newton Method.The Bisection Method code starts by defining the function to be used, describing the interval, tolerance and maximum iterations.The code then implements bisection method. The Newton Method starts by defining the function and its derivative, describing the initial guess, tolerance, maximum iteration and iteration counter. It then implements the Newton Method.

2 Explanation of the Bisection Method code

```
import math

#defining the function
def f(x):
    return x**4+8*x**2-9

#The interval are described
a = 1
b = -1

tolerance = 1e-6 #tolerance
max_iterations=100 #maximum iterations

#Implementation of the Bisection Method begins
for i in range (max_iterations):
    c = (a+b)/2
    if abs(f(c))<tolerance:
        print(f"Root found at x = {c: .6f}")
        break

    elif f(c)*f(a)<0:
            b=c
```

```
    else:
        a=c
```

3 Explanation of the Newton Method code

```
import math
#defining the function
def f(x):
    return x**4+8*x**2-9

#derivative of the function
def df(x):
    return 4*x**3+16*x

#initial guess
x0 = 1
tolerance = 1e-6 #tolerance
max_iterations=100 #maximum iteration
count=0 # iteration counter

#implementation of the Newton Method
for i in range(max_iterations):
    fx = f(x0)
    dfx = df(x0)
    x1 = x0 - (f(x0)/dfx)

    if abs (f(x1)) < tolerance:
        print(f"Root found at x={x1:.6f}")
        break

    else:
        x0=x1

print(count)
```