Name : Deepankar Sharma

Course: BCA

University Roll No: 2092014

Student Id : 20041299

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**Practical No:06 Secant Method**

**Objective:** To find root of the equation using secant method.

**2. Algorithm:**

1. Start

2. Define function as f(x)

3. Input:

a. Initial guess x0, x1

b. Tolerable Error e

c. Maximum Iteration N

4. Initialize iteration counter step = 1

5. Do

If f(x0) = f(x1)

Print "Mathematical Error"

Stop

End If

x2 = x1 - (x1 - x0) \* f(x1) / ( f(x1) - f(x0) )

x0 = x1

x1 = x2

step = step + 1

If step > N

Print "Not Convergent"

Stop

End If

While abs f(x2) > e

6. Print root as x2

1. Stop

**3. Code :**

#include <stdio.h>

#include <math.h>

#include <stdlib.h>

#define phi(x) (x \* x + 4 \* sin(x))

double differential(double x0)

{

const double delta = 1.0e-10;

double x1 = x0 - delta;

double x2 = x0 + delta;

double y1 = phi(x1);

double y2 = phi(x2);

// printf("gradient= %f\n", grad);

return (y2 - y1) / (x2 - x1);

// return (pow(-2.718282, -1\*x)-cos(x));

}

int main()

{

int k = 0;

double x0, x1, x2, f0, f1, f2, g0;

int step = 1, N;

double allErr;

printf("Enter the allowed Error: ");

scanf(" %lf", &allErr);

printf("Enter the interval lower limit: ");

scanf(" %lf", &x0);

printf("Enter the interval upper limit: ");

scanf(" %lf", &x1);

printf("Enter maximum iteration: ");

scanf("%d", &N);

{

{

printf("\nStep\t\tx0\t\tx1\t\tf(x0)\t\tf(x1)\t\tx2=(x0f1-x1f0)/(f1-f0)\t\tf(x2)\n");

do

{

f0 = phi(x0);

f1 = phi(x1);

if (f0 == f1)

{

printf("Mathematical Error.");

exit(0);

}

x2 = x1 - (x1 - x0) \* f1 / (f1 - f0);

f2 = phi(x2);

printf("%d\t\t%f\t%f\t%f\t%f\t%f\t\t\t\t%f\n", step, x0, x1, f0, f1, x2, f2);

x0 = x1;

f0 = f1;

x1 = x2;

f1 = f2;

step = step + 1;

if (step > N)

{

printf("Not Convergent.");

exit(0);

}

} while (fabs(f2) > allErr);

printf("\nRoot is: %f\n", x1);

}

}

}

**4. Output:**

Enter the allowed Error: 0.0001

Enter the interval lower limit: -2

Enter the interval upper limit: -1

Enter maximum iteration: 10

Step x0 x1 f(x0) f(x1) x2=(x0f1-x1f0)/(f1-f0) f(x2)

1 -2.000000 -1.000000 0.362810 -2.365884 -1.867039 -0.339926

2 -1.000000 -1.867039 -2.365884 -0.339926 -2.012515 0.434146

3 -1.867039 -2.012515 -0.339926 0.434146 -1.930923 -0.014943

4 -2.012515 -1.930923 0.434146 -0.014943 -1.933638 -0.000610

5 -1.930923 -1.933638 -0.014943 -0.000610 -1.933754 0.000001

Root is: -1.933754