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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 x_0, x_1
 - b. Tolerable Error e
 - c. Maximum Iteration N
 4. Initialize iteration counter $step = 1$
 5. Do
 - If $f(x_0) = f(x_1)$
 - Print "Mathematical Error"
 - Stop
 - End If
 - $x_2 = x_1 - (x_1 - x_0) * f(x_1) / (f(x_1) - f(x_0))$
 - $x_0 = x_1$
 - $x_1 = x_2$
 - $step = step + 1$
 - If $step > N$
 - Print "Not Convergent"
 - Stop
 - End If
- While $abs f(x_2) > e$

6. Print root as x2

7. 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);
    {
```


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