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**Practical No:06 Regula Falsi Method**

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

**2. Algorithm:**

1. Start

2. Define function f(x)

3. Input

a. Lower and Upper guesses x0 and x1

b. tolerable error e

4. If f(x0)\*f(x1) > 0

print "Incorrect initial guesses"

goto 3

End If

5. Do

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

If f(x0)\*f(x2) < 0

x1 = x2

Else

x0 = x2

End If

While abs(f(x2) > e

6. Print root as x2

1. Stop
2. **Code :**

#include <stdio.h>

#include <math.h>

#include <stdlib.h>

#define phi(x) (x\*x)- log(x)- 12

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);

    f0 = phi(x0);

    f1 = phi(x1);

    if (f0 \* f1 > 0.0)

    {

        printf("\n\nIncorrect Initial Guesses !!!!\n");

        exit(0);

    }

    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

            {

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

                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;

                x1=x2;

                f0=f1;

                f1=f2;

                // if (f0 \* f2 < 0)

                // {

                //     x1 = x2;

                //     f1 = f2;

                // }

                // else

                // {

                //     x0 = x2;

                //     f0 = f2;

                // }

                step = step + 1;

            } while (fabs(f2) > allErr);

            printf("\nRoot is: %f\n", x2);

        }

    }

}

**4. Output:**

Enter the allowed Error: 0.0001

Enter the interval lower limit: 3

Enter the interval upper limit: 4

Enter maximum iteration: 6

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

1 3.000000 4.000000 -4.098612 2.613706 3.610611 -0.247368

2 4.000000 3.610611 2.613706 -0.247368 3.644277 -0.012402

3 3.610611 3.644277 -0.247368 -0.012402 3.646054 0.000065

Root is: 3.646054