Date -
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PRACTICAL 3

- **Objective:** To write a C++ program to find the root of the equation ($x^3 - 2x - 5$) using Secant method.

- **Algorithm:**

1. Start
2. Define function as f(x)
3. Input initial guesses (x_0 and x_1), tolerable error (e) and maximum iteration (N)
4. Initialize iteration counter i = 1.
5. If $f(x_o) = f(x_1)$ then print “Mathematical error” and goto (11) otherwise goto (6)
6. Calculate $x_2 = x_1 – ((x_1 – x_0)*f(x_0) / (f(x_1) - f(x_0)))$
7. Increment iteration counter i = i + 1
8. If i >= N then print “Not convergent” and goto (11) otherwise goto (9)
9. If $|f(x_2)| > e$ then set $x_0 = x_1$, $x_1 = x_2$ and goto (5) otherwise goto (10)
10. Print root as x_2
11. Stop

- **Practical Code:**

```
#include<iostream>
#include<iomanip>
#include<math.h>
#define f(x) x*x*x - 2*x - 5
using namespace std;

int main() {
   float x0, x1, x2, f0, f1, f2, e;
   int step = 1, N;
   cout << setprecision(6) << fixed;
   cout << "Enter first guess : ";
   cin >> x0;
   cout << "Enter Second guess : ";
   cin >> x1;
   cout << "Enter tolerable error : ";
   cin >> e;
   cout << "Enter maximum iteration : ";
   cin >> N;
   cout << endl << "******" << endl;
   cout << "Secant Method" << endl;
   cout << "*****"<<endl;
   do
   {
      f0 = f(x0);
      f1 = f(x1);
      if(f0==f1) {
```

```
            cout << "Mathematical Error.";
            exit(0);
        }
        x2 = x1 - ((x1-x0) * f1)/(f1-f0);
        f2 = f(x2);
        cout<<"Iteration "<<step<<" :\t x"<<step<<" = "<<x2<<" and f(x"<<step<<") = "<<f2<<endl;
        x0 = x1;
        f0 = f1;
        x1 = x2;
        f1 = f2;
        step = step+1;
        if(step > N+1) {
            cout << "Not Convergent.";
            exit(0);
        }
    } while(fabs(f2) > e);
    cout << endl << "Root is: " << x2;
    return 0;
}
```

- **Output:**

```
Enter First guess : 0
Enter Second guess : 2
Enter tolerable error : 0.000001
Enter maximum iterations : 10
******
Secant Method
*****
Iteration 1 :    x1 = 2.500000 and f(x1) = 5.625000
Iteration 2 :    x2 = 2.075472 and f(x2) = -0.210679
Iteration 3 :    x3 = 2.090798 and f(x3) = -0.041807
Iteration 4 :    x4 = 2.094592 and f(x4) = 0.000454
Iteration 5 :    x5 = 2.094551 and f(x5) = -0.000002
Iteration 6 :    x6 = 2.094552 and f(x6) = 0.000001

Root is : 2.094552
```

- **Application:**
  a. Used to solve transcendental equations.