

# Golden Search Algorithm

## CODE:

```
#include <iostream>

#include <cmath>

using namespace std;

double f(double x) {

    return x*x*x*x - 14*x*x*x + 60*x*x - 70*x;

}

const double phi = (1 + sqrt(5)) / 2;

double golden_search(double a, double b, double tol) {

    double L = a;

    double R = b;

    double x1 = R - (R - L) / phi;

    double x2 = L + (R - L) / phi;

    double f1 = f(x1);

    double f2 = f(x2);

    int k = 0;

    cout << "Table for Golden Search\n";

    cout << "| K | L | R | X1K | X2K | F(X1K) | F(X2K) |\n";

    while (R - L > tol) {

        cout << "| " << k << " | " << L << " | " << R << " | " << x1 <<
" | " << x2 << " | " << f1 << " | " << f2 << " |\n";

        if (f1 < f2) {

            R = x2;

            x2 = x1;

            f2 = f1;

            x1 = R - (R - L) / phi;

            f1 = f(x1);

        }

    }

}
```

```

    }

    else {

        L = x1;

        x1 = x2;

        f1 = f2;

        x2 = L + (R - L) / phi;

        f2 = f(x2);

    }

    k++;

}

return (L + R) / 2;

}

int main() {

    int n;

    double c[5], a, b, tol;

    cout << "Degree of Golden Section Function Equation: ";

    cin >> n;

    for (int i = n; i >= 0; i--) {

        cout << "Enter The Coefficient of x Power " << i << ": ";

        cin >> c[i];

    }

    cout << "Your equation: ";

    for (int i = n; i >= 0; i--) {

        if (i == n) {

            cout << c[i] << "x^" << i;

        } else if (i == 0) {

            cout << " + " << c[i];

        } else {

            cout << " + " << c[i] << "x^" << i;


```

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    }

}

cout << endl;

cout << "Enter Range of x initial to final: ";

cin >> a >> b;

cout << "Golden section search algorithm:\n";

cout << "Enter smaller length of Search Interval: ";

cin >> tol;

double result = golden_search(a, b, tol);

cout << "Minimum Value for X: " << result << endl;

cout << "And f(x) is: " << f(result) << endl;

return 0;

}

```

### OUTPUT:

```

Degree of Golden Section Function Equation: 4
Enter The Coefficient of x Power 4: 1
Enter The Coefficient of x Power 3: -14
Enter The Coefficient of x Power 2: 60
Enter The Coefficient of x Power 1: -70
Enter The Coefficient of x Power 0: 0
Your equation: 1x^4 + -14x^3 + 60x^2 + -70x^1 + 0
Enter Range of x initial to final: 0
2
Golden section search algorithm:
Enter smaller length of Search Interval: 0.05
Table for Golden Search
| K | L | R | X1K | X2K | F(X1K) | F(X2K) |
| 0 | 0 | 2 | 0.763932 | 1.23607 | -24.3607 | -18.9582 |
| 1 | 0 | 1.23607 | 0.472136 | 0.763932 | -21.0985 | -24.3607 |
| 2 | 0.472136 | 1.23607 | 0.763932 | 0.944272 | -24.3607 | -23.5925 |
| 3 | 0.472136 | 0.944272 | 0.652476 | 0.763932 | -23.8374 | -24.3607 |
| 4 | 0.652476 | 0.944272 | 0.763932 | 0.832816 | -24.3607 | -24.2879 |
| 5 | 0.652476 | 0.832816 | 0.72136 | 0.763932 | -24.2579 | -24.3607 |
| 6 | 0.72136 | 0.832816 | 0.763932 | 0.790243 | -24.3607 | -24.3669 |
| 7 | 0.763932 | 0.832816 | 0.790243 | 0.806504 | -24.3669 | -24.3495 |
Minimum Value for X: 0.785218
And f(x) is: -24.369

...Program finished with exit code 0
Press ENTER to exit console.

```