

# PRACTICAL-2(b): REGULA-FALSI METHOD

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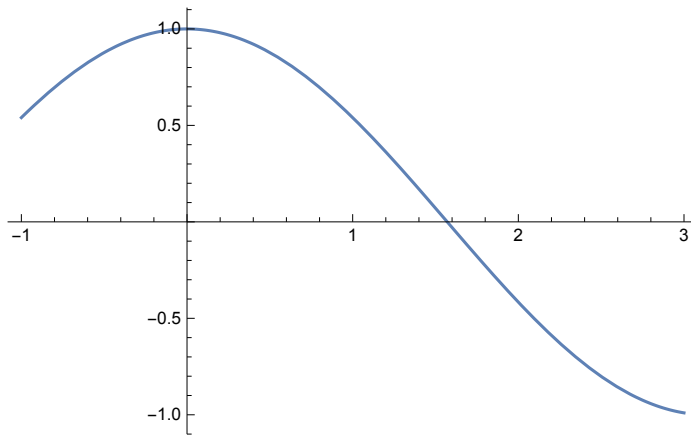
COURSE:- B.Sc.(H) COMPUTER SCIENCE

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Method of false position: Taking parameter as input

```
x0 = Input["Enter first guess :"];
x1 = Input["Enter second guess :"];
Nmax = Input["Enter maximum number of iterations :"];
eps = Input["Enter a value of convergence parameter :"];
Print["x0 = ", x0];
Print["Nmax = ", Nmax];
Print["epsilon = ", eps];
f[x_] := Cos[x];
Print["f[x] := ", f[x]];
If[N[f[x0] * f[x1]] > 0,
Print["These values do not satisfy the IVP so change the values."],
For[i = 1, i ≤ Nmax, i++, a = N[x1 - f[x1] * (x1 - x0) / (f[x1] - f[x0]), 16];
If[Abs[(x1 - x0) / 2] < eps, Return[N[a, 16]],
Print[i, "th iteration value is :", N[a, 16]];
Print["Estimated error is :", N[x1 - x0, 16]];
If[f[a] * f[x1] > 0, x1 = a, x0 = a]]];
Print["Root is:", N[a, 16]];
Print["Estimated error is : ", N[x1 - x0, 16]];
Plot[f[x], {x, -1, 3}]
```

```
x0 = 0
Nmax = 10
epsilon = 0.0001
f[x] := Cos[x]
1th iteration value is :1.412282927437392
Estimated error is :2.000000000000000
2th iteration value is :1.573906323722879
Estimated error is :0.587717072562608
3th iteration value is :1.570783521943903
Estimated error is :0.161623396285487
4th iteration value is :1.57079632681545
Estimated error is :0.003122801778976
Return[1.57079632679490]
```



## Method of false position:Taking parameter as input

```

falseposition[f_, x0_, x1_, Nmax_, eps_] :=
If[N[f[x0] * f[x1]] > 0,
Print["These values do not satisfy the IVP so change the values."],
y0 = x0;
y1 = x1;
a = y1;
If[Abs[y1 - y0] < eps,
Return[N[a, 8]],
For[i = 1, i ≤ Nmax, i++, a = N[y1 - f[y1] * (y1 - y0) / (f[y1] - f[y0])];
If[f[a] * f[y1] > 0, y1 = a, y0 = a];
If[Abs[y1 - y0] < eps, Return[N[a, 8]]];
Print[i "th iteration value is : ", N[a, 8]];
Print["Estimated error is : ", N[y1 - y0, 8]]];
Print["Root is : ", N[a, 8]];
Print["Estimated error is : ", N[y1 - y0, 8]]];
Plot[f[x], {x, -1, 3}]]
f[x] := Cos[x];
falseposition[f, 0, 2, 5, 0.00000001]

```

1th iteration value is : 1.41228

Estimated error is : 0.587717

2th iteration value is : 1.57391

Estimated error is : 0.161623

3th iteration value is : 1.57078

Estimated error is : 0.0031228

4th iteration value is : 1.5708

Estimated error is : 0.0000128049

1.5708

## Method of false position : Constructing a function

```

x0 = 0;
x1 = 2.0;
Nmax = 10;
eps = 0.000000000001;
f[x_] := Cos[x];
If[N[f[x0] * f[x1]] > 0,
Print["These values do not satisfy the IVP so change the values."],
If[Abs[(x1 - x0) / 2] < eps, Return[N[x1, 8]],
For[i = 1, i ≤ Nmax, i++, a = N[x1 - f[x1] * (x1 - x0) / (f[x1] - f[x0]), 8];
If[f[a] * f[x1] > 0, x1 = a, x0 = a];
If[Abs[x1 - x0] < eps, Return[N[a, 8]]];
Print[i, "th iteration value is :", N[a, 8]];
Print["Estimated error is :", N[x1 - x0, 8]]];
Print["Root is:", N[a, 8]];
Print["Estimated error is : ", N[x1 - x0, 8]]];
Plot[f[x], {x, -1, 3}, PlotRange → {-1, 1}, PlotStyle → Red, PlotLabel → "f[x] =" f[x],
AxesLabel → {x, f[x]}, AspectRatio → Automatic, Frame → True, GridLines → Automatic,
ClippingStyle → Automatic, Filling → Axis, FillingStyle → LightBrown]

1th iteration value is :1.41228
Estimated error is :0.587717

2th iteration value is :1.57391
Estimated error is :0.161623

3th iteration value is :1.57078
Estimated error is :0.0031228

4th iteration value is :1.5708
Estimated error is :0.0000128049

5th iteration value is :1.5708
Estimated error is :2.05567×10-11

6th iteration value is :1.5708
Estimated error is :2.05567×10-11

7th iteration value is :1.5708
Estimated error is :2.05567×10-11

8th iteration value is :1.5708
Estimated error is :2.05567×10-11

9th iteration value is :1.5708
Estimated error is :2.05567×10-11

10th iteration value is :1.5708
Estimated error is :2.05567×10-11

Root is:1.5708
Estimated error is : 2.05567×10-11

```

