

# PRACTICLE – 1

## Bisection method

Abhishek Kumar

Roll No : – 20 222 756

B.Voc. (Software Development)

In[32]:= Ques – 1

```
x0 = 0;
x1 = 2.0;
Nmax = 20;
eps = 0.0001;
f[x_] := Cos[x];
If[N[f[x0] * f[x1]] > 0,
  Print[
    "Your values do not satisfy the IVP, so change
the values."],
  For[i = 1, i ≤ Nmax, i++, m = (x0 + x1) / 2;
    if[Abs[(x1 - x0) / 2] < eps, Return[m],
      Print[i, "th iteration value is : ", m];
      Print["Estimated error in ", i,
        "th iteration is : ", (x1 - x0) / 2];
      If[f[m] * f[x1] > 0, x1 = m, x0 = m]]];
  Print["Root is :", m]
  Print["Estimated error in ", i,
    "th iteration is : ", (x1 - x0) / 2]]
Plot[f[x], {x, -1, 3}, PlotRange → {-1, 1},
  PlotStyle → {Red, Thick}, PlotLabel → "f[x] = " f[x],
  AxesLabel → {x, f[x]}]
```

Out[32]= - 1 + Ques

1th iteration value is : 1.  
Estimated error in 1th iteration is : 1.  
2th iteration value is : 1.5  
Estimated error in 2th iteration is : 0.5  
3th iteration value is : 1.75  
Estimated error in 3th iteration is : 0.25  
4th iteration value is : 1.625  
Estimated error in 4th iteration is : 0.125  
5th iteration value is : 1.5625  
Estimated error in 5th iteration is : 0.0625  
6th iteration value is : 1.59375  
Estimated error in 6th iteration is : 0.03125  
7th iteration value is : 1.57813  
Estimated error in 7th iteration is : 0.015625  
8th iteration value is : 1.57031  
Estimated error in 8th iteration is : 0.0078125  
9th iteration value is : 1.57422  
Estimated error in 9th iteration is : 0.00390625  
10th iteration value is : 1.57227  
Estimated error in 10th iteration is : 0.00195313  
11th iteration value is : 1.57129  
Estimated error in 11th iteration is : 0.000976563  
12th iteration value is : 1.5708  
Estimated error in 12th iteration is : 0.000488281  
13th iteration value is : 1.57056  
Estimated error in 13th iteration is : 0.000244141  
14th iteration value is : 1.57068  
Estimated error in 14th iteration is : 0.00012207  
15th iteration value is : 1.57074  
Estimated error in 15th iteration is : 0.0000610352  
16th iteration value is : 1.57077  
Estimated error in 16th iteration is : 0.0000305176  
17th iteration value is : 1.57079  
Estimated error in 17th iteration is : 0.0000152588  
18th iteration value is : 1.57079  
Estimated error in 18th iteration is :  $7.62939 \times 10^{-6}$

19th iteration value is : 1.5708

Estimated error in 19th iteration is :  $3.8147 \times 10^{-6}$

20th iteration value is : 1.5708

Estimated error in 20th iteration is :  $1.90735 \times 10^{-6}$

Root is :1.5708

Estimated error in 21th iteration is :  $9.53674 \times 10^{-7}$

Out[38]= Null<sup>2</sup>

