Prakhar Khugshal || BSc(Hons) Computer Science || Semester IV || 20211441

Regular Falsi

Q1

```
x0 = Input["Enter first guess: "];
x1 = Input ["Enter scond guess: "];
Nmax = Input["Enter maximum of iterations : " ];
eps = Input["Enter the value of covergence parameter: "];
Print["x0=", x0];
Print["x1=", x1];
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 does 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, "the iteration value is:", N[a16]];
   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 eror is:", N[x1 - x0, 16]]];
Plot[f[x], {x, -1, 3}]
```

x0=1

x1=2

Nmax=20

epsilon= $\frac{1}{1\,000\,000}$

f(x):=Cos[x]

1the iteration value is:a16

Estimated error is: 1.000000000000000

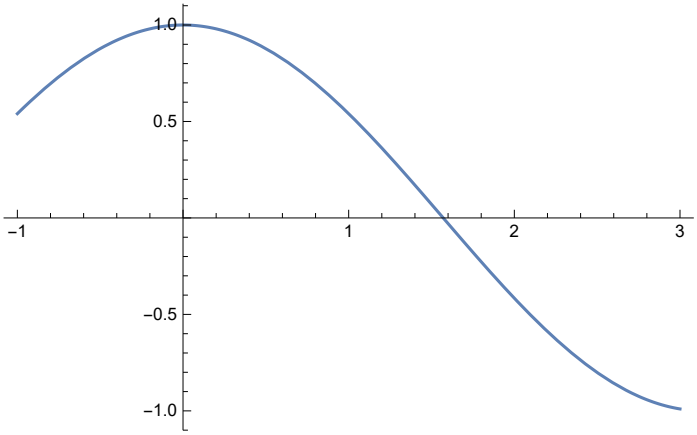
```
2the iteration value is:a16
Estimated error is: 0.435095624108422
3the iteration value is:a16
Estimated error is: 0.006074198643440
4the iteration value is:a16
Estimated error is: 0.000182248761967
5the iteration value is:a16
Estimated error is: 0.00018224774012
6the iteration value is:a16
Estimated error is: 0.00018224774012
7the iteration value is:a16
Estimated error is: 0.0001822477401
8the iteration value is:a16
Estimated error is: 0.0001822477401
9the iteration value is:a16
Estimated error is: 0.0001822477401
10the iteration value is:a16
Estimated error is: 0.000182247740
11the iteration value is:a16
Estimated error is: 0.000182247740
12the iteration value is:a16
Estimated error is: 0.000182247740
13the iteration value is:a16
Estimated error is: 0.000182247740
14the iteration value is:a16
Estimated error is: 0.00018224774
15the iteration value is:a16
Estimated error is: 0.00018224774
16the iteration value is:a16
Estimated error is: 0.00018224774
17the iteration value is:a16
Estimated error is: 0.0001822477
18the iteration value is:a16
Estimated error is: 0.0001822477
19the iteration value is:a16
Estimated error is: 0.0001822477
```

```
20the iteration value is:a16

Estimated error is: 0.000182248

Root is: 1.570796327

Estimated eror is:0.000182248
```



Q2

```
x0 = Input["Enter first guess: "];
x1 = Input ["Enter scond guess: "];
Nmax = Input["Enter maximum of iterations : " ];
eps = Input["Enter the value of covergence parameter: "];
Print["x0=", x0];
Print["x1=", x1];
Print["Nmax=", Nmax];
Print["epsilon=", eps];
f[x_] := x^3 - 5 * x + 1;
Print["f(x):=", f[x]]; If[N[f[x0] * f[x1]] > 0,
 Print["These values does 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, "the iteration value is:", N[a16]];
   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 eror is:", N[x1 - x0, 16]]];
Plot[f[x], {x, -1, 3}]
```

x0=1

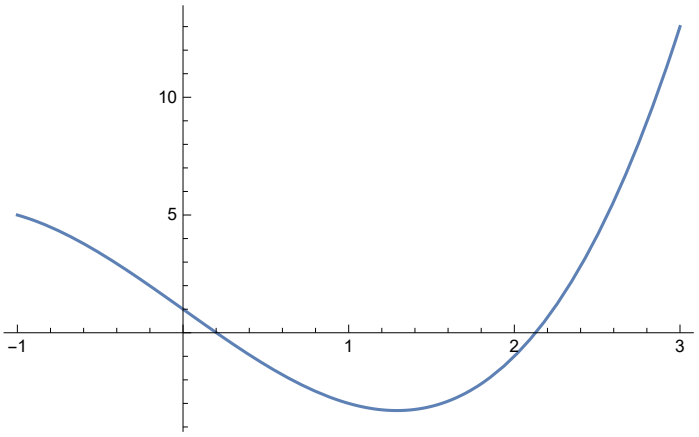
x1=2

Nmax=20

epsilon= $\frac{1}{1\,000\,000}$

f(x) :=1 − 5 x + x^3

These values does not satisfy the IVP so change the values



Q3

```
x0 = Input["Enter first guess: "];
x1 = Input ["Enter scond guess: "];
Nmax = Input["Enter maximum of iterations : " ];
eps = Input["Enter the value of covergence parameter: "];
Print["x0=", x0];
Print["x1=", x1];
Print["Nmax=", Nmax];
Print["epsilon=", eps];
f[x_] := Cos[x] - x * e^x;
Print["f(x):=", f[x]]; If[N[f[x0] * f[x1]] > 0,
 Print["These values does 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, "the iteration value is:", N[a16]];
   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 eror is:", N[x1 - x0, 16]]];
Plot[f[x], {x, -1, 3}]
```

```
x0=1
```

```
x1=2
```

```
Nmax=20
```

$$\text{epsilon}=\frac{1}{1\,000\,000}$$

```
f(x):=-e^x x+Cos[x]
```