Practical-1

Akshay Kumar
BSc(H) Computer Science
Numerical Methods Practical

Bisection Method

Ques-1. Find out the roots of the function f(x) = Cosx in the interval[0,2] using Bisection method. Compute the approx value of the root after 14 iteration.

In[1]:=

```
f[x_] := Cos[x]
x0 = 0.0;
x1 = 2.0;
n = 14;
If[f[x0] * f[x1] > 0,
  Print["These values do not fit in IVT. So, please change values"],
  For [i = 1, i ≤ n, i++, a = (x0 + x1) / 2;
     Print[i, "th iteration value is ", a];
    If[f[x0] * f[a] < 0, x1 = a, x0 = a];];];
```

```
1th iteration value is 1.
2th iteration value is 1.5
3th iteration value is 1.75
4th iteration value is 1.625
5th iteration value is 1.5625
6th iteration value is 1.59375
7th iteration value is 1.57813
8th iteration value is 1.57031
9th iteration value is 1.57422
10th iteration value is 1.57227
11th iteration value is 1.57129
12th iteration value is 1.5708
13th iteration value is 1.57056
14th iteration value is 1.57068
```

Ques-2. f(x)=x^3+x^2-3x-3, (1,2)

In[6]:=
```
f[x_] := x^3 + x^2 - 3 x - 3
x0 = 1.0;
x1 = 2.0;
n = 14;
If[f[x0] * f[x1] > 0,
  Print["These values do not fit in IVT. So, please change values"],
  For [i = 1, i ≤ n, i++, a = (x0 + x1) / 2;
     Print[i, "th iteration value is ", a];
    If[f[x0] * f[a] < 0, x1 = a, x0 = a];];];
```

```
1th iteration value is 1.5
2th iteration value is 1.75
3th iteration value is 1.625
4th iteration value is 1.6875
5th iteration value is 1.71875
6th iteration value is 1.73438
7th iteration value is 1.72656
8th iteration value is 1.73047
9th iteration value is 1.73242
10th iteration value is 1.73145
11th iteration value is 1.73193
12th iteration value is 1.73218
13th iteration value is 1.73206
14th iteration value is 1.73199
```

Ques-3. f(x)=Sinx, (3,4)

In[11]:=
```
f[x_] := Sin[x]
x0 = 3.0;
x1 = 4.0;
n = 14;
If[f[x0] * f[x1] > 0,
  Print["These values do not fit in IVT. So, please change values"],
  For [i = 1, i ≤ n, i++, a = (x0 + x1) / 2;
     Print[i, "th iteration value is ", a];
    If[f[x0] * f[a] < 0, x1 = a, x0 = a];];];
```

```
1th iteration value is 3.5
2th iteration value is 3.25
3th iteration value is 3.125
4th iteration value is 3.1875
5th iteration value is 3.15625
6th iteration value is 3.14063
7th iteration value is 3.14844
8th iteration value is 3.14453
9th iteration value is 3.14258
10th iteration value is 3.1416
11th iteration value is 3.14111
12th iteration value is 3.14136
13th iteration value is 3.14148
14th iteration value is 3.14154
```

Ques-4. f(x)=1-logx, (2,3)

In[16]:=

```
f[x_] := 1 - Log[x]
x0 = 2.0;
x1 = 3.0;
n = 14;
If[f[x0] * f[x1] > 0,
  Print["These values do not fit in IVT. So, please change values"],
  For [i = 1, i ≤ n, i++, a = (x0 + x1) / 2;
     Print[i, "th iteration value is ", a];
    If[f[x0] * f[a] < 0, x1 = a, x0 = a];];];
```

```
1th iteration value is 2.5
2th iteration value is 2.75
3th iteration value is 2.625
4th iteration value is 2.6875
5th iteration value is 2.71875
6th iteration value is 2.70313
7th iteration value is 2.71094
8th iteration value is 2.71484
9th iteration value is 2.7168
10th iteration value is 2.71777
11th iteration value is 2.71826
12th iteration value is 2.71851
13th iteration value is 2.71838
14th iteration value is 2.71832
```

Ques-5. f(x)=x^2-5, (2,3)

In[21]:=

```
f[x_] := x^2 - 5
x0 = 2.0;
x1 = 3.0;
n = 14;
If[f[x0] * f[x1] > 0,
  Print["These values do not fit in IVT. So, please change values"],
  For [i = 1, i ≤ n, i++, a = (x0 + x1) / 2;
     Print[i, "th iteration value is ", a];
    If[f[x0] * f[a] < 0, x1 = a, x0 = a];];];
```

```
1th iteration value is 2.5
2th iteration value is 2.25
3th iteration value is 2.125
4th iteration value is 2.1875
5th iteration value is 2.21875
6th iteration value is 2.23438
7th iteration value is 2.24219
8th iteration value is 2.23828
9th iteration value is 2.23633
10th iteration value is 2.23535
11th iteration value is 2.23584
12th iteration value is 2.23608
13th iteration value is 2.23596
14th iteration value is 2.23602
```