

Practical 2(a)

NAME : Naveen Kumar

ROLL NO : 20211437

**COURSE : BSc(hons)Computer
Science**

SEMESTER : 4

Secant Method

Question I :

```

x0 = Input["Enter first guess:"];
x1 = Input["Enter second guess:"];
Nmax = Input["Enter maximum number of iterations:"];
eps = Input["Enter the value of convergence parameter:"];
Print["x0=", x0];
Print["x1=", x1];
Print["Nmax=", Nmax];
Print["epsilon=", eps];
f[x_] := Cos[x];
Print["f[x] :=", f[x]];
For[i = 1, 1 ≤ Nmax, i++,
  x2 = N[x1 - (f[x] /. x → x1) * (x1 - x0) / ((f[x] /. x → x1) - (f[x] /. x → x0))];
  If[Abs[x1 - x2] < eps, Return[x2], x0 = x1; x1 = x2];
  Print["In ", i, "th number of iterations the root is:", x2];
  Print["Estimated error is:", Abs[x1 - x0]]];
Print["Root is:", x2];
Print["Estimated error is:", Abs[x2 - x1]];
Plot[f[x], {x, -1, 3}]

```

x0=1

x1=2

Nmax=20

$\text{eps} = \frac{1}{1000000}$

f[x]:=Cos[x]

In 1th number of iterations the root is:1.5649

Estimated error is:0.435096

In 2th number of iterations the root is:1.57098

Estimated error is:0.0060742

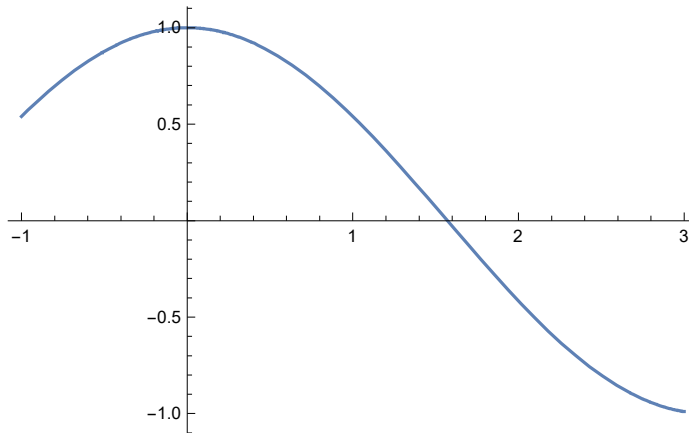
In 3th number of iterations the root is:1.5708

Estimated error is:0.000182249

Return[1.5708]

Root is:1.5708

Estimated error is: 1.02185×10^{-9}



Question 2 :

```

x0 = Input["Enter first guess:"];
x1 = Input["Enter second guess:"];
Nmax = Input["Enter maximum number of iterations:"];
eps = Input["Enter the value of convergence 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]];
For[i = 1, 1 ≤ Nmax, i++,
  x2 = N[x1 - (f[x] /. x → x1) * (x1 - x0) / ((f[x] /. x → x1) - (f[x] /. x → x0))];
  If[Abs[x1 - x2] < eps, Return[x2], x0 = x1; x1 = x2];
  Print["In ", i, "th number of iterations the root is:", x2];
  Print["Estimated error is:", Abs[x1 - x0]]];
Print["Root is:", x2];
Print["Estimated error is:", Abs[x2 - x1]];
Plot[f[x], {x, -1, 3}]

```

```
x0=1
```

```
x1=2
```

```
Nmax=20
```

```
epsilon= $\frac{1}{1000000}$ 
```

```
f[x]:=1-5 x + x3
```

```
In 1th number of iterations the root is:2.5
```

```
Estimated error is:0.5
```

```
In 2th number of iterations the root is:2.09756
```

```
Estimated error is:0.402439
```

```
In 3th number of iterations the root is:2.12134
```

```
Estimated error is:0.0237786
```

```
In 4th number of iterations the root is:2.12859
```

```
Estimated error is:0.0072456
```

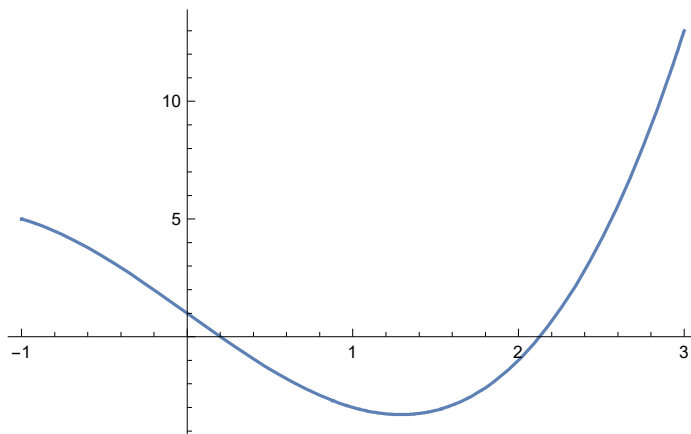
```
In 5th number of iterations the root is:2.12842
```

```
Estimated error is:0.000166952
```

```
Return[2.12842]
```

```
Root is:2.12842
```

```
Estimated error is: $8.77361 \times 10^{-7}$ 
```



Question 3 :

```

x0 = Input["Enter first guess:"];
x1 = Input["Enter second guess:"];
Nmax = Input["Enter maximum number of iterations:"];
eps = Input["Enter the value of convergence parameter:"];
Print["x0=", x0];
Print["x1=", x1];
Print["Nmax=", Nmax];
Print["epsilon=", eps];
f[x_] := Cos[x] - x * Exp[x];
Print["f[x] :=", f[x]];
For[i = 1, 1 ≤ Nmax, i++,
  x2 = N[x1 - (f[x] /. x → x1) * (x1 - x0) / ((f[x] /. x → x1) - (f[x] /. x → x0))];
  If[Abs[x1 - x2] < eps, Return[x2], x0 = x1; x1 = x2];
  Print["In ", i, "th number of iterations the root is:", x2];
  Print["Estimated error is:", Abs[x1 - x0]]];
Print["Root is:", x2];
Print["Estimated error is:", Abs[x2 - x1]];
Plot[f[x], {x, -1, 3}]

x0=1
x1=2
Nmax=20
epsilon= $\frac{1}{1000000}$ 
f[x] := -ex x + Cos[x]

In 1th number of iterations the root is:0.832673
Estimated error is:1.16733
In 2th number of iterations the root is:0.728779
Estimated error is:0.103894
In 3th number of iterations the root is:0.562401
Estimated error is:0.166377
In 4th number of iterations the root is:0.524782
Estimated error is:0.0376189
In 5th number of iterations the root is:0.518014
Estimated error is:0.00676874
In 6th number of iterations the root is:0.517759
Estimated error is:0.0002547
In 7th number of iterations the root is:0.517757
Estimated error is:1.50138×10-6

```

```
Return[0.517757]
```

```
Root is:0.517757
```

```
Estimated error is: $3.22103 \times 10^{-10}$ 
```

