

PRACTICAL-3

Secant Method

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Ques-1

```
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, i ≤ 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= $1. \times 10^{-6}$

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

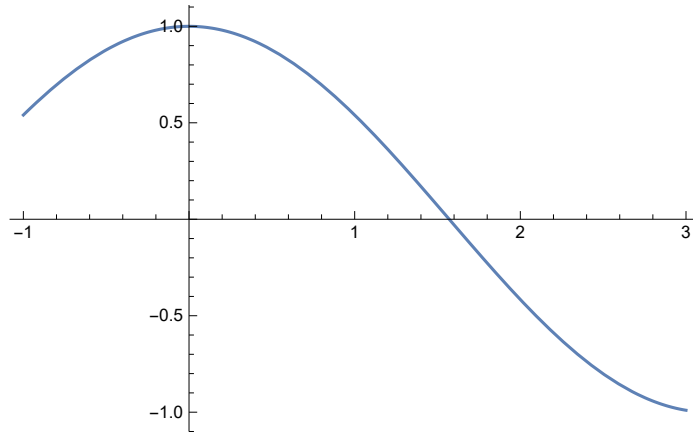
In 3th number of iterations the root is:1.5708

estimated error is:0.000182249

Return[1.5708]

root is:1.5708

estimated error is: 1.02185×10^{-9}



Ques-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, i ≤ 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}]
```

$x_0=0$

$x_1=1$

$N_{\max}=20$

$\epsilon=1. \times 10^{-6}$

$f[x] := 1 - 5x + x^3$

In 1th number of iterations the root is:0.25

estimated error is:0.75

In 2th number of iterations the root is:0.186441

estimated error is:0.0635593

In 3th number of iterations the root is:0.201736

estimated error is:0.0152956

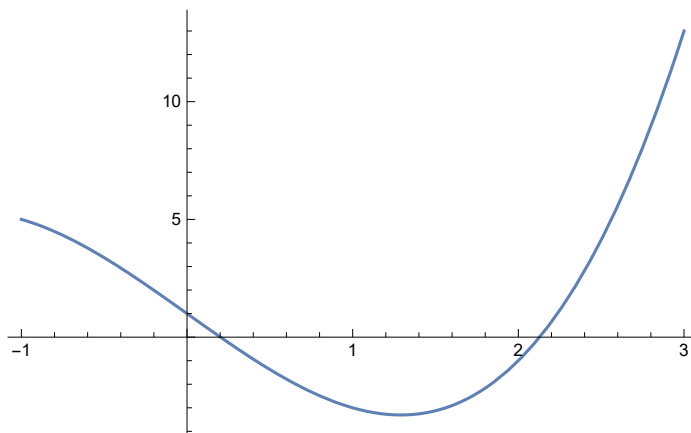
In 4th number of iterations the root is:0.20164

estimated error is:0.0000964033

Return[0.20164]

root is:0.20164

estimated error is: 1.7717×10^{-7}



Ques-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, i ≤ 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=0

x1=1

Nmax=20

epsilon= 1×10^{-6}

f[x] := $-e^x x + \cos[x]$

In 1th number of iterations the root is:0.314665

estimated error is:0.685335

In 2th number of iterations the root is:0.446728

estimated error is:0.132063

In 3th number of iterations the root is:0.531706

estimated error is:0.0849777

In 4th number of iterations the root is:0.516904

estimated error is:0.0148014

In 5th number of iterations the root is:0.517747

estimated error is:0.000842998

In 6th number of iterations the root is:0.517757

estimated error is: 9.90548×10^{-6}

Return[0.517757]

root is:0.517757

estimated error is: 7.07182×10^{-9}

