PRACTICAL-I
Secant method
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Ques:1

In[33]:=
```
x0 = 0;
x1 = 1.0;
Nmax = 20;
eps = 0.00001;
f[x_] := Cos[x];
For[i = 1, i ≤ Nmax, i++, x2 = x1 - ((f[x1] * (x1 - x0)) / (f[x1] - f[x0]));
  If[Abs[(x1 - x2)] / 2 < eps, Return[x2], x0 = x1; x1 = x2];
  Print[i, "th iteration value is :", x2];
  Print["Estimated error in ", i, " th iteration is : ", Abs[x1 - x0]]];
Print["Root is :", x2];
Print["Estimated error in ", Abs[x2 - x1]];
Plot[f[x], {x, -1, 3}, PlotRange → {-2, 2},
 PlotStyle → {Red, Thick}, PlotLabel → "f[x] = " f[x], AxesLabel → {x, f[x]}]
```

1th iteration value is :2.17534

Estimated error in 1 th iteration is : 1.17534

2th iteration value is :1.57278

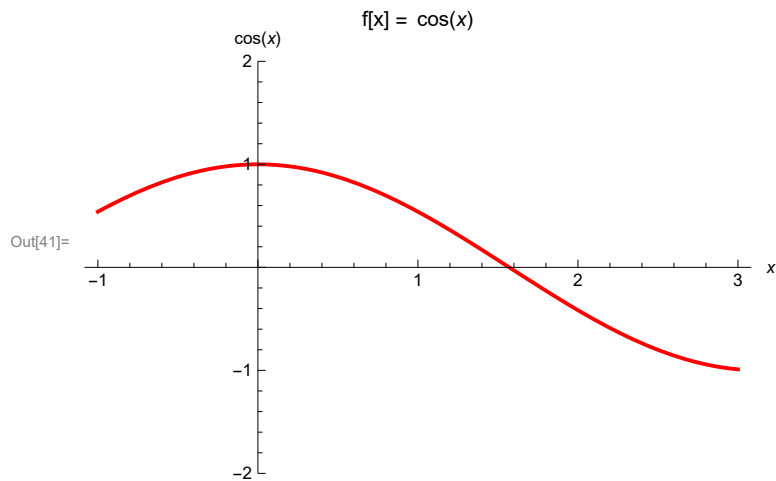Estimated error in 2 th iteration is : 0.602559

3th iteration value is :1.57067

Estimated error in 3 th iteration is : 0.00211435

4th iteration value is :1.5708

Estimated error in 4 th iteration is : 0.000126873

Out[38]= Return[1.5708]

Root is :1.5708

Estimated error in 7.81941×10^{-11}

Out[41]=

f[x] = cos(x)

Ques:2

In[24]:=
```
x0 = 0;
x1 = 1.0;
Nmax = 20;
eps = 0.0001;
f[x_] := Cos[x] - x (E^x);
For[i = 1, i ≤ Nmax, i++, x2 = x1 - ((f[x1] * (x1 - x0)) / (f[x1] - f[x0]));
  If[Abs[(x1 - x2)] / 2 < eps, Return[x2], x0 = x1; x1 = x2];
  Print[i, "th iteration value is :", x2];
  Print["Estimated error in ", i, " th iteration is : ", Abs[x1 - x0]]];
Print["Root is :", x2];
Print["Estimated error in ", Abs[x2 - x1]];
Plot[f[x], {x, -1, 3}, PlotRange → {-2, 2},
  PlotStyle → {Red, Thick}, PlotLabel → "f[x] = " f[x], AxesLabel → {x, f[x]}]
```

1th iteration value is :0.314665

Estimated error in 1 th iteration is : 0.685335

2th iteration value is :0.446728

Estimated error in 2 th iteration is : 0.132063

3th iteration value is :0.531706

Estimated error in 3 th iteration is : 0.0849777

4th iteration value is :0.516904

Estimated error in 4 th iteration is : 0.0148014

5th iteration value is :0.517747

Estimated error in 5 th iteration is : 0.000842998

Out[29]= Return[0.517757]

Root is :0.517757

Estimated error in 9.90548×10^{-6}

$f[x] = \left(\cos(x) - e^x\, x \right)$