Practical 1 :- Bisection Method

Q1 : Find the 5 th approximation of f (x) = $\ln(1+x) - \cos(x) = 0$ in the given interval (0, 1).

In[6]:=
```
f[x_] := Log[1 + x] - Cos[x];
a = 0; b = 1; p = (a + b)/2;
For[i = 1, i ≤ 5, i++,
 If[f[p] * f[b] < 0, a = p, b = p];
 p = (a + b)/2;
]
Print["5th Approximation = ", N[p]]
Print["Corresponding Interval = (", N[a], ",", N[b], ")"]
```

```
5th Approximation = 0.890625

Corresponding Interval = (0.875,0.90625)
```

Q2 : Find the Root of f (x) = $\ln(1+x) - \cos(x) = 0$ in the given interval (0, 1) with tollerance 10^{-6}.

In[11]:=
```
ClearAll["Global*`"];
f[x_] := Log[1 + x] - Cos[x];
a = 0; b = 1; p = (a + b)/2; ϵ = 10^-6;
For[i = 1, i ≤ Infinity, i++,
 If[f[p] * f[b] < 0, a = p, b = p];
 p = (a + b)/2;
 If[Abs[(b - a)/2^i] < ϵ, Break[]]
]
Print["Final Approximation = ", N[p]]
Print["Corresponding Interval = (", N[a], ",", N[b], ")"]
```

```
Final Approximation = 0.884277

Corresponding Interval = (0.883789,0.884766)
```

Q3 : Find the Root of f (x) = $x^3 + 2x^2 - 3x - 1 = 0$ in the given interval (1, 2) with tollerance 10^{-10}.

In[17]:=
```
ClearAll["Global*`"];
f[x_] := x^3 + 2 x^2 - 3 x - 1;
a = 1; b = 2; p = (a + b)/2; ϵ = 10^-10;
For[i = 1, i ≤ Infinity, i++,
 If[f[p] * f[b] < 0, a = p, b = p];
 p = (a + b)/2;
 If[Abs[(b - a)/2^i] < ϵ, Break[]]
]
Print["Final Approximation = ", N[p]]
Print["Corresponding Interval = (", N[a], ",", N[b], ")"]
```

```
Final Approximation = 1.19869

Corresponding Interval = (1.19868,1.19869)
```