Secant Method

Q1 f(x)= x^3 +2 x^2 -3 x-1

In[7]:=

```
f[x_] := x^3 + 2 x^2 - 3 x - 1
```

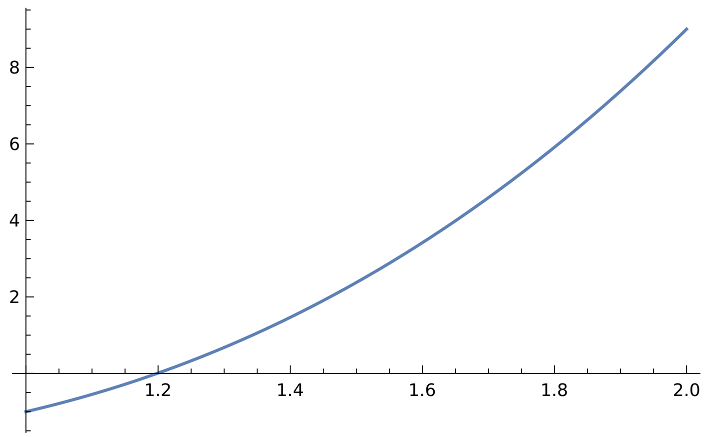
In[8]:=

```
Subscript[P, 0] = 2;
Subscript[P, 1] = 1;
ϵ = 0.000005;
Nmax = 10;
For[n = 2, n ≤ Nmax, n++,
Subscript[P, n] =
   N[Subscript[P, n - 1] - (f[Subscript[P, n - 1]] * (Subscript[P, n - 1] - Subscript[P, n - 2]) /
         (f[Subscript[P, n - 1]] - f[Subscript[P, n - 2]]))];
If[Abs[Subscript[P, n] - Subscript[P, n - 1]] < ϵ, Return[Subscript[P, n]]];
Print[n - 1, "th iteration value is ", Subscript[P, n]];
Print["estimated error is :", Abs[Subscript[P, n] - Subscript[P, n - 1]]]];
Plot[f[x], {x, 1, 2}]
```

```
1th iteration value is 1.1
estimated error is :0.1
2th iteration value is 1.22173
estimated error is :0.121729
3th iteration value is 1.19649
estimated error is :0.0252442
4th iteration value is 1.19865
estimated error is :0.00216004
5th iteration value is 1.19869
estimated error is :0.000045968
```

Out[12]= 1.19869

Out[13]=



Q2 f(x)=e^-x -x

In[32]:=

```
f[x_] := Exp[-x] - x
```

In[33]:=

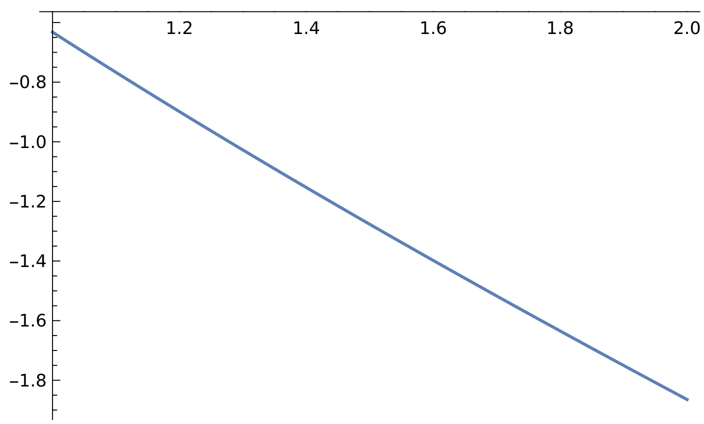
```
Subscript[P, 0] = 2;
Subscript[P, 1] = 1;
ϵ = 0.000005;
Nmax = 10;
For[n = 2, n ≤ Nmax, n++,
Subscript[P, n] =
   N[Subscript[P, n - 1] - (f[Subscript[P, n - 1]] * (Subscript[P, n - 1] - Subscript[P, n - 2]) /
         (f[Subscript[P, n - 1]] - f[Subscript[P, n - 2]]))];
If[Abs[Subscript[P, n] - Subscript[P, n - 1]] < ϵ, Return[Subscript[P, n]]];
Print[n - 1, "th iteration value is ", Subscript[P, n]];
Print["estimated error is :", Abs[Subscript[P, n] - Subscript[P, n - 1]]]];
```

```
1th iteration value is 0.487142
estimated error is :0.512858
2th iteration value is 0.573076
estimated error is :0.0859347
3th iteration value is 0.56723
estimated error is :0.00584616
4th iteration value is 0.567143
estimated error is :0.0000869484
```

Out[37]= 0.567143

In[38]:=
```
Plot[f[x], {x, 1, 2}]
```

Out[38]=



Q3 f(x)=x^3 -13

In[39]:=
```
f[x_] := x ^ 3 - 13
```

In[40]:=
```
Subscript[P, 0] = 0;
Subscript[P, 1] = 3;
ϵ = 0.000005;
Nmax = 10;
For[n = 2, n ≤ Nmax, n++,
Subscript[P, n] =
   N[Subscript[P, n - 1] - (f[Subscript[P, n - 1]] * (Subscript[P, n - 1] - Subscript[P, n - 2]) /
        (f[Subscript[P, n - 1]] - f[Subscript[P, n - 2]]))];
If[Abs[Subscript[P, n] - Subscript[P, n - 1]] < ϵ, Return[Subscript[P, n]]];
Print[n - 1, "th iteration value is ", Subscript[P, n]];
Print["estimated error is :", Abs[Subscript[P, n] - Subscript[P, n - 1]]]];
```

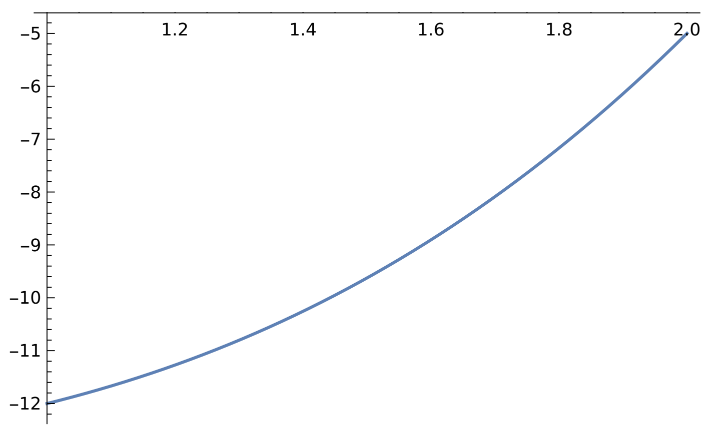
```
1th iteration value is 1.44444
estimated error is :1.55556
2th iteration value is 2.09207
estimated error is :0.647629
3th iteration value is 2.49729
estimated error is :0.405212
4th iteration value is 2.33475
estimated error is :0.162534
5th iteration value is 2.35034
estimated error is :0.0155903
6th iteration value is 2.35134
estimated error is :0.000999479
7th iteration value is 2.35133
```

estimated error is :7.03717×10^{-6}

Out[44]= 2.35133

In[45]:= **Plot[f[x], {x, 1, 2}]**

Out[45]=



Q 4 f(x) = x^3- 3x^2 +2x +5

In[46]:= **f[x_] := x ^ 3 - 3 x ^ 2 + 2 x + 5**

In[47]:=
```
Subscript[P, 0] = 0;
Subscript[P, 1] = -1;
ϵ = 0.000005;
Nmax = 10;
For[n = 2, n ≤ Nmax, n++,
Subscript[P, n] =
   N[Subscript[P, n - 1] - (f[Subscript[P, n - 1]] * (Subscript[P, n - 1] - Subscript[P, n - 2]) /
         (f[Subscript[P, n - 1]] - f[Subscript[P, n - 2]]))];
If[Abs[Subscript[P, n] - Subscript[P, n - 1]] < ϵ, Return[Subscript[P, n]]];
Print[n - 1, "th iteration value is ", Subscript[P, n]];
Print["estimated error is :", Abs[Subscript[P, n] - Subscript[P, n - 1]]]];
```

```
1th iteration value is -0.833333
estimated error is :0.166667
2th iteration value is -0.900277
estimated error is :0.0669437
3th iteration value is -0.904325
estimated error is :0.00404786
4th iteration value is -0.90416
estimated error is :0.000164377
```

Out[51]= -0.904161

In[52]:=
```
Plot[f[x], {x, 1, 2}]
```

Out[52]=