2 + 3

5

2 * 3

6

5 / 3

$\frac{5}{3}$

4 / 2

2

2 × 3

6

N[5 / 3, 20]

1.6666666666666666667

E

e,

N[E]

2.71828

Log[10]

Log[10]

N[Log[10]]

2.30259

N[Log[E]]

1.

N[Log[10, 100]]

2.

sin[Pi / 2]

$\sin\left[\frac{\pi}{2}\right]$

Sin[Pi / 2]

1

```
Sin[Pi / 4]
```

$$\frac{1}{\sqrt{2}}$$

```
N[Pi]
```

```
3.14159
```

```
N[Pi, 20]
```

```
3.1415926535897932385
```

```
Sum[k, {k, 1, m = n}]
```

$$\frac{1}{2} n (1 + n)$$

```
Sum[k, {k, 1, n}]
```

$$\frac{1}{2} n (1 + n)$$

```
Sum[k, {k, 1, 15}]
```

```
120
```

```
Sum[k^2, {k, 1, n}]
```

$$\frac{1}{6} n (1 + n) (1 + 2 n)$$

```
Sum[k^3, {k, 1, n}]
```

$$\frac{1}{4} n^2 (1 + n)^2$$

```
Matrix[2, 2]
```

```
Matrix[2, 2]
```

```
A = {1, 3, 5}, {2, 4, 6}, {7, 8, 9}
```

```
A = {A = {1, 3, 5}, {2, 4, 6}, {7, 8, 9}}
```

```
{{1, 3, 5}, {2, 4, 6}, {7, 8, 9}}
```

```
A // MatrixForm
```

$$\begin{pmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

```
B = {{1, 2, 3}, {4, 5, 6}}
```

```
{{1, 2, 3}, {4, 5, 6}}
```

B // MatrixForm

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$$

Det[A]

```
0
```

Inverse[A]

```
Inverse::sing : Matrix {{1, 3, 5}, {2, 4, 6}, {7, 8, 9}} is singular. ≫
Inverse[{{1, 3, 5}, {2, 4, 6}, {7, 8, 9}}]
```

Tr[A]

```
14
```

Solve[x^2 - 2 x + 3 == 0, x]

$$\{\{x \to 1 - i\sqrt{2}\}, \{x \to 1 + i\sqrt{2}\}\}$$

Solve[x^2 + x + 1 == 0, x]

$$\{\{x \to -(-1)^{1/3}\}, \{x \to (-1)^{2/3}\}\}$$

NSolve[x^2 + x + 1 == 0, x]

```
{{x → -0.5 - 0.866025 i}, {x → -0.5 + 0.866025 i}}
```

Solve[x^2 + x + 1 == = 0, x]

Solve[x^2 + x + 1 == 0, x]

$$\{\{x \to -(-1)^{1/3}\}, \{x \to (-1)^{2/3}\}\}$$

Factor[x^2 - 2 x + 3]

$$3 - 2x + x^2$$

Factor[x^2 + 2 x + 1]

$$(1 + x)^2$$

Factor[x^2 + 2 x + 3]

$$3 + 2x + x^2$$

Factor[x^2 + 2 x - 3]

$$(-1 + x)(3 + x)$$

Factor[x^3 - 2 x + 3]

$$3 - 2x + x^3$$

```
Factor[x^3 - 2 x + 3.0]
```

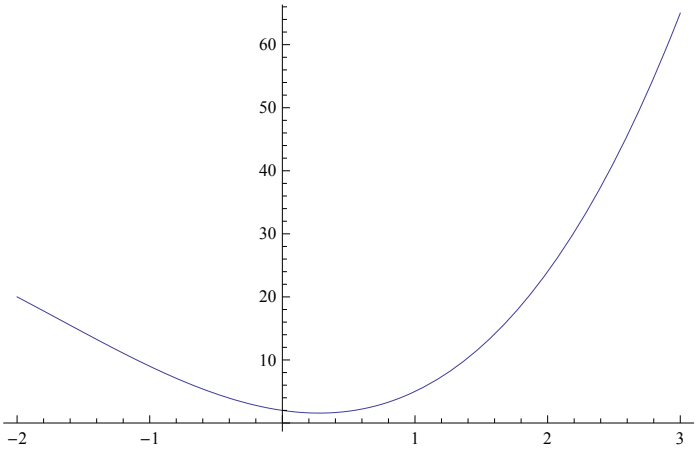
$$1.\ (1.89329 + 1.\ x)\ \left(1.58454 - 1.89329\ x + 1.\ x^2\right)$$

```
f[x_] := x^3 + 5 x^2 - 3 x + 2
```

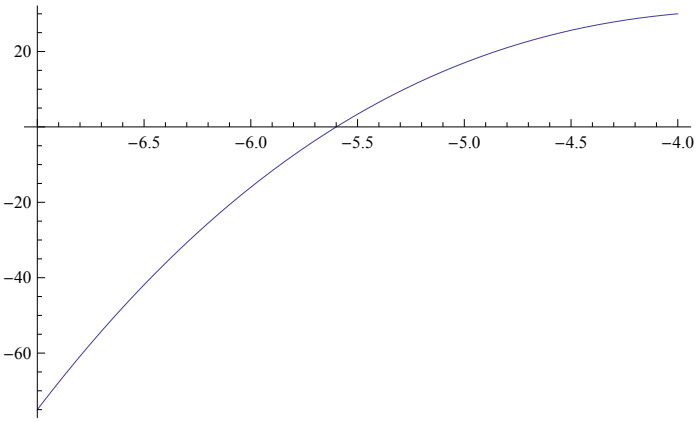
```
f[1]
```

```
5
```

```
Plot[f[x], {x, -2, 3}]
```




```
Plot[f[x], {x, -7, -4}]
```

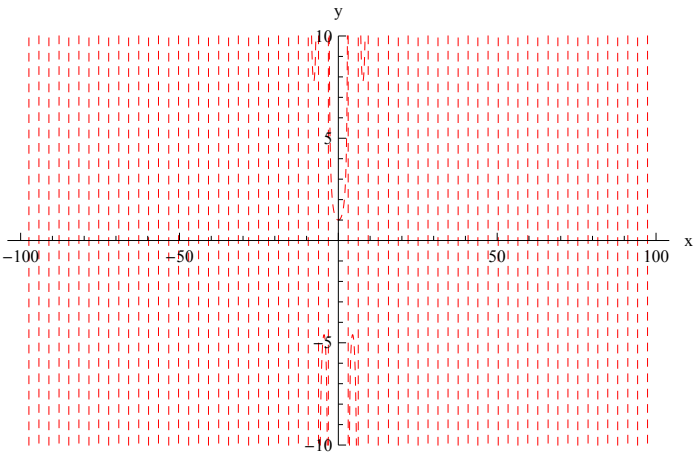



```
NSolve[f[x] == 0, x]
```

```
{{x → -5.59954}, {x → 0.299772 - 0.517019 i}, {x → 0.299772 + 0.517019 i}}
```

```
f[x_] := x / Sin[x]
```

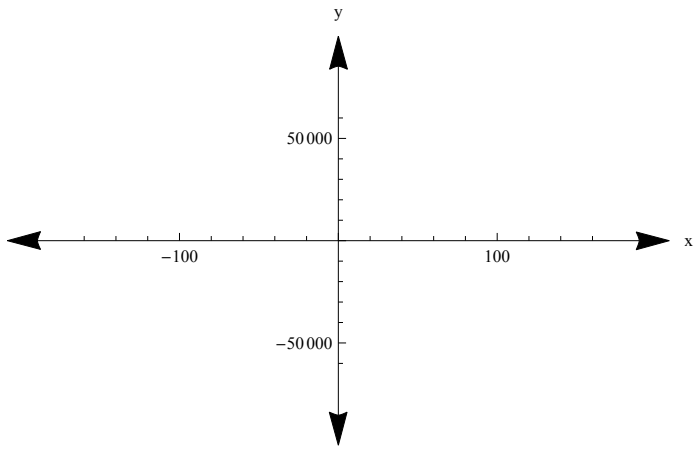
```
Plot[f[x], {x, -100, 100}, AxesLabel -> {"x", "y"},
 PlotRange → {-10, 10}, PlotStyle → {Red, Dashed}]
```




```
NSolve[f[x] == 0, x]
```

```
{{x → -0.5 - 0.866025 i}, {x → -0.5 + 0.866025 i}}
```

```
Plot[f[x], {x, -200, 200}, AxesLabel -> {"x", "y"}, PlotRange → {-100 000, 100 000},
 PlotStyle → {Green}, AxesStyle → Arrowheads[{-0.05, 0.05}]]
```




```
D[f[x], x]
```

```
Csc[x] - x Cot[x] Csc[x]
```

```
D[f[x], {x, 2}]
```

```
-2 Cot[x] Csc[x] + x (Cot[x]^2 Csc[x] + Csc[x]^3)
```

```
I
```

```
i
```

```
i
```

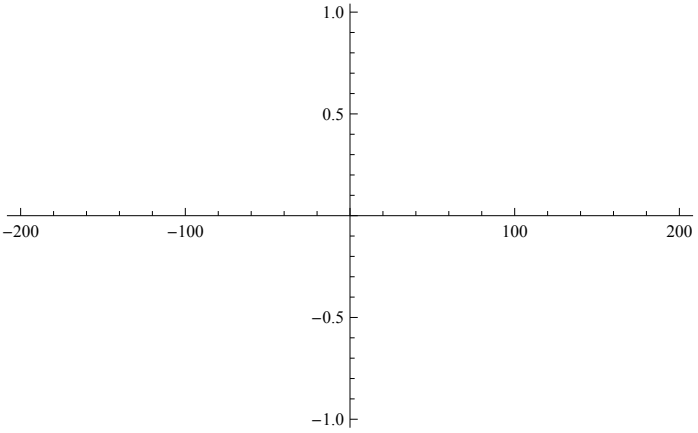
```
i
```

```
Integrate[f[x], x]
```

$$x \left(\text{Log}\left[1 - e^{i x}\right] - \text{Log}\left[1 + e^{i x}\right]\right) + i \left(\text{PolyLog}\left[2, -e^{i x}\right] - \text{PolyLog}\left[2, e^{i x}\right]\right)$$

```
Integral[f[x], {x, -1, 1}]
Integral[x Csc[x], {x, -1, 1}]
```

```
Plot[Integral[f[x]], {x, -200, 200}]
```




```
f[x_] := x (Log[1 - e^(i x)] - Log[1 + e^(i x)]) + i (PolyLog[2, -e^(i x)] - PolyLog[2, e^(i x)])
Plot[f[x], {x, -200, 200}, AxesLabel -> {"x", "y"}, PlotRange → {-10 000, 10 000},
 PlotStyle → {Green}, AxesStyle → Arrowheads[{-0.05, 0.05}]]
```

```
DSolve[y'[x] + 2 y[x] == x, y[x], x]
```

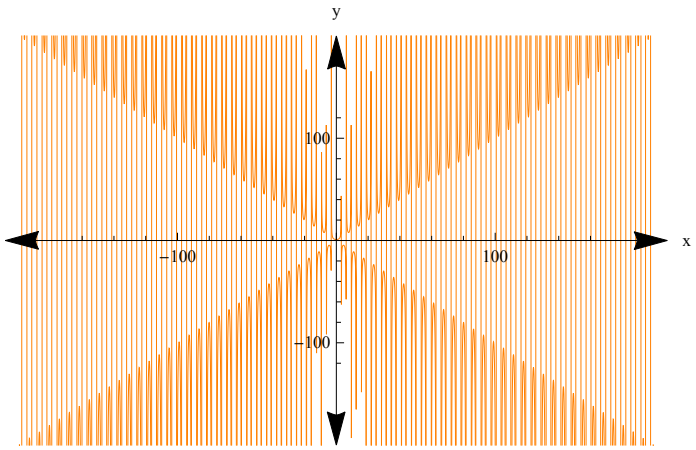
$$\left\{\left\{y[x] \to -\frac{1}{4} + \frac{x}{2} + e^{-2x} C[1]\right\}\right\}$$

```
x^2 + 2 x /. x → 2
```

```
8
```

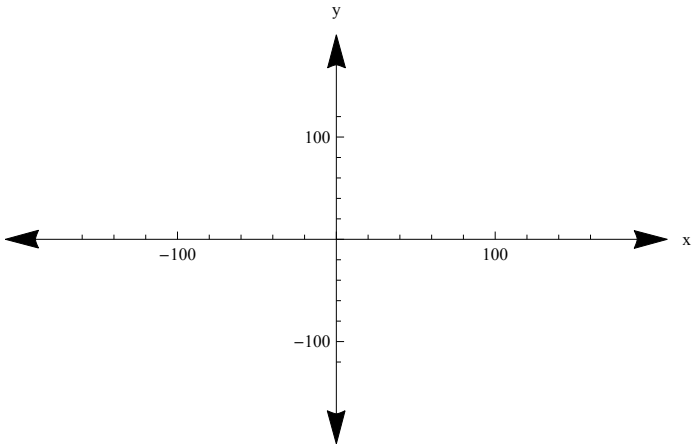
```
f[x_] := x / Sin[x]
```

```
Plot[f[x], {x, -200, 200}, AxesLabel -> {"x", "y"}, PlotRange → {-200, 200},
 PlotStyle → {Orange}, AxesStyle → Arrowheads[{-0.05, 0.05}]]
```




```
f[x_] := √(1 - (x - 1) ^ 2)
```

```
Plot[f[x], {x, -200, 200}, AxesLabel -> {"x", "y"}, PlotRange → {-200, 200},
 PlotStyle → {Orange}, AxesStyle → Arrowheads[{-0.05, 0.05}]]
```




```
n = 6 ;
For[ i = -24, i < 6, i = i + 3,
 r = If[i ≥ 0, i, -i];
 Print["Absolute value of ", i, " is ", r]]
Print[r]
```

```
Absolute value of -24 is 24

Absolute value of -21 is 21

Absolute value of -18 is 18

Absolute value of -15 is 15

Absolute value of -12 is 12

Absolute value of -9 is 9

Absolute value of -6 is 6

Absolute value of -3 is 3

Absolute value of 0 is 0

Absolute value of 3 is 3

3
```

```
ClearAll;

y = Input[];
Print["y = ", y];
a = If[y ≥ 0, y, -y];
Print["Absolute Value of y is: ", a]
```

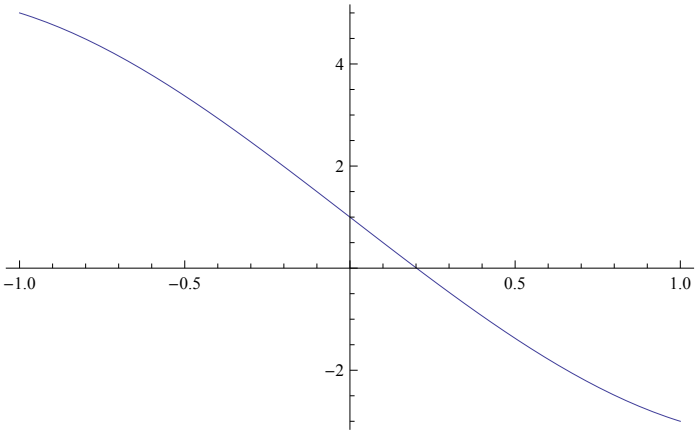
```
y = 5

Absolute Value of y is: 5

y = -5

Absolute Value of y is: 5

y = -5

Absolute Value of y is: 5

y = -5
```

* Bisection Method *

Syntax::tsntxi : "*Bisection Method*" is incomplete; more input is needed.

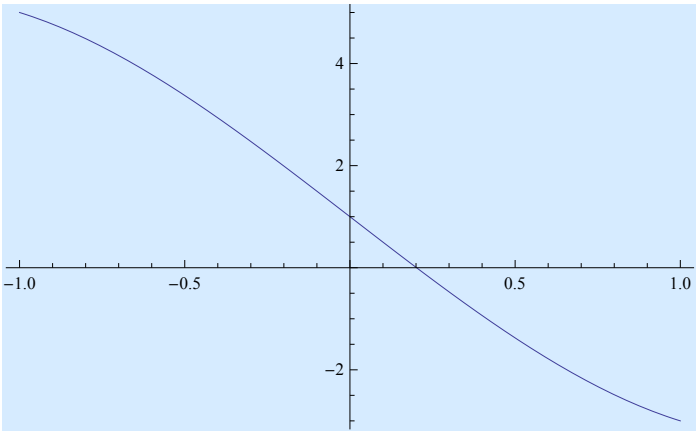
Syntax::sntxi : Incomplete expression; more input is needed .

```
f[x_] := x^3 - 5 x + 1;
a = 0;
b = 1;
nmax = 15;
Plot[f[x], {x, -1, 1}]
For[i = 1, i ≤ nmax, i++, c = (a + b) / 2;
 Print["Root after iteration ", i,
  " is c= ", N[c, 6], " f(c) = ", N[f[c], 6], "\n"];
 If[f[a] * f[c] < 0, b = c, a = c];
]
```

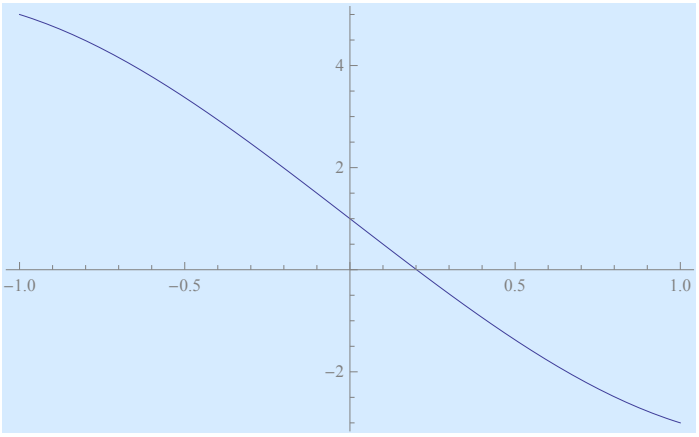


```
Root after iteration 1 is c= 0.500000 f(c) = -1.37500

Root after iteration 2 is c= 0.250000 f(c) = -0.234375

Root after iteration 3 is c= 0.125000 f(c) = 0.376953

Root after iteration 4 is c= 0.187500 f(c) = 0.0690918

Root after iteration 5 is c= 0.218750 f(c) = -0.0832825

Root after iteration 6 is c= 0.203125 f(c) = -0.00724411

Root after iteration 7 is c= 0.195313 f(c) = 0.0308881

Root after iteration 8 is c= 0.199219 f(c) = 0.0118129

Root after iteration 9 is c= 0.201172 f(c) = 0.00228208

Root after iteration 10 is c= 0.202148 f(c) = -0.00248160

Root after iteration 11 is c= 0.201660 f(c) = -0.0000999043

Root after iteration 12 is c= 0.201416 f(c) = 0.00109105

Root after iteration 13 is c= 0.201538 f(c) = 0.000495564

Root after iteration 14 is c= 0.201599 f(c) = 0.000197827

Root after iteration 15 is c= 0.201630 f(c) = 0.0000489610
```

Show[%80, Background → RGBColor[0.84, 0.92, 1.]]

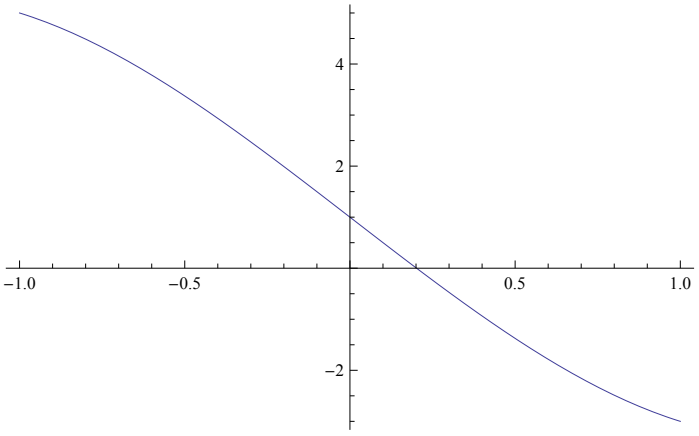


```
Show[%82, AxesStyle → Gray]
```



In[1]:=
```
f[x_] := x^3 - 5 x + 1;
a = 0;
b = 1;
nmax = 15;
Plot[f[x], {x, -1, 1}]
For[i = 1, i ≤ nmax, i++, c = (a + b) / 2;
 Print[TableForm[{{i, N[c, 4], N[f[c], 4]}}]];
 If[f[a] * f[c] < 0, b = c, a = c];
]
```

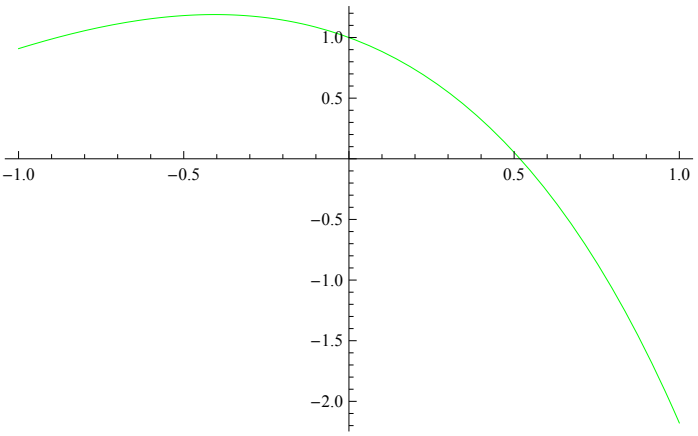
Out[5]=



1	0.5000	-1.375
2	0.2500	-0.2344
3	0.1250	0.3770
4	0.1875	0.06909
5	0.2188	-0.08328
6	0.2031	-0.007244
7	0.1953	0.03089
8	0.1992	0.01181
9	0.2012	0.002282
10	0.2021	-0.002482
11	0.2017	-0.00009990
12	0.2014	0.001091
13	0.2015	0.0004956
14	0.2016	0.0001978
15	0.2016	0.00004896

In[19]:=
```
f[x_] := Cos[x] - x * E^x;
a = 0;
b = 1;
nmax = 10;
Plot[f[x], {x, -1, 1}, PlotStyle → Green]
For[i = 1, i ≤ nmax, i++, c = (a + b) / 2;
 Print[TableForm[{{i, N[c, 4], N[f[c], 4]}}]];
 If[f[a] * f[c] < 0, b = c, a = c];
]
```

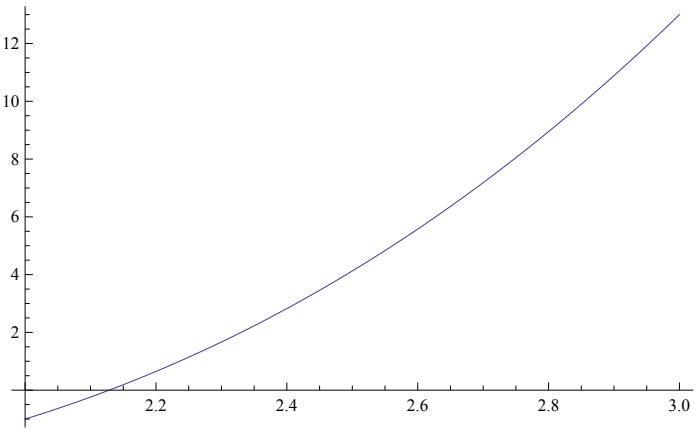
Out[23]=



```
1    0.5000    0.05322
2    0.7500    -0.8561
3    0.6250    -0.3567
4    0.5625    -0.1413
5    0.5313    -0.04151
6    0.5156    0.006475
7    0.5234    -0.01736
8    0.5195    -0.005404
9    0.5176    0.0005452
10    0.5186    -0.002427
```

In[37]:=
```
f[x_] := x^3 - 5 x + 1;
x0 = 2;
x1 = 3;
nmax = 5;
Plot[f[x], {x, x0, x1}]
For[i = 1, i ≤ nmax, i++, x2 = N[x1 - ((x1 - x0) / (f[x1] - f[x0])) f[x1]];
 Print["Root after iteration ", i, " is ", x2]; x0 = x1; x1 = x2;
]
```

Out[41]=

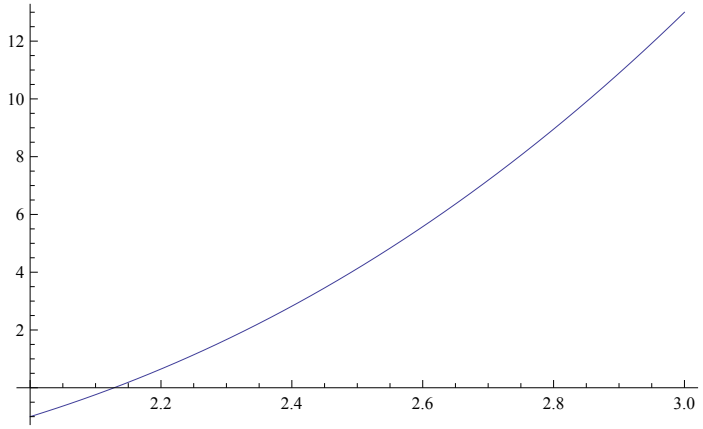



```
Root after iteration 1 is 2.07143
Root after iteration 2 is 2.10376
Root after iteration 3 is 2.12952
Root after iteration 4 is 2.1284
Root after iteration 5 is 2.12842
```

In[43]:= *** Secant Method ***

In[49]:=
```
f[x_] := x^3 - 5 x + 1;
x0 = 2;
x1 = 3;
nmax = 5;
Plot[f[x], {x, x0, x1}]
For[i = 1, i ≤ nmax, i++, x2 = N[x1 - ((x1 - x0) / (f[x1] - f[x0])) f[x1]];
 Print["Root after iteration ", i, " is ", x2]; x0 = x1; x1 = x2;
]
```

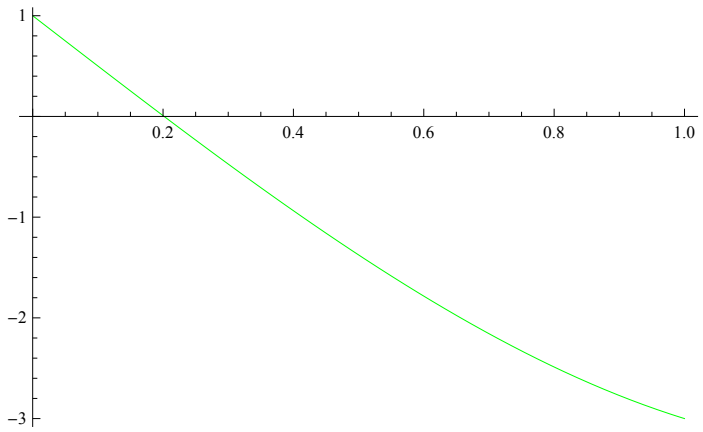
Out[53]=




```
Root after iteration 1 is 2.07143

Root after iteration 2 is 2.10376

Root after iteration 3 is 2.12952

Root after iteration 4 is 2.1284

Root after iteration 5 is 2.12842
```

In[78]:=
```
f[x_] := x^3 - 5 x + 1;
x0 = 0;
x1 = 1;
nmax = 8;
Plot[f[x], {x, x0, x1}, PlotStyle → Green]
For[i = 1, i ≤ nmax, i++, x2 = N[x1 - ((x1 - x0) / (f[x1] - f[x0])) f[x1]];
 Print[TableForm[{{i, N[x2], N[f[x2]]}}]]; x0 = x1; x1 = x2;
]
```

Out[82]=



1	0.25	−0.234375
2	0.186441	0.0742773
3	0.201736	−0.000471116
4	0.20164	-8.64229×10^{-7}
5	0.20164	1.03527×10^{-11}
6	0.20164	-2.22045×10^{-16}
7	0.20164	1.11022×10^{-16}
8	0.20164	1.11022×10^{-16}