Introduction to Mathematica

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Overview

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- A mathematical symbolic computation program
- Conceived by Stephen Wolfram
- Developed by Wolfram Research
- Written in C/C++, Java and Mathematica
- Chinese is available after Mathematica 7.0
- The latest version: Mathematica 11.0.1

Overview

Libraries of mathematical functions

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Data and function visualization and animation tools

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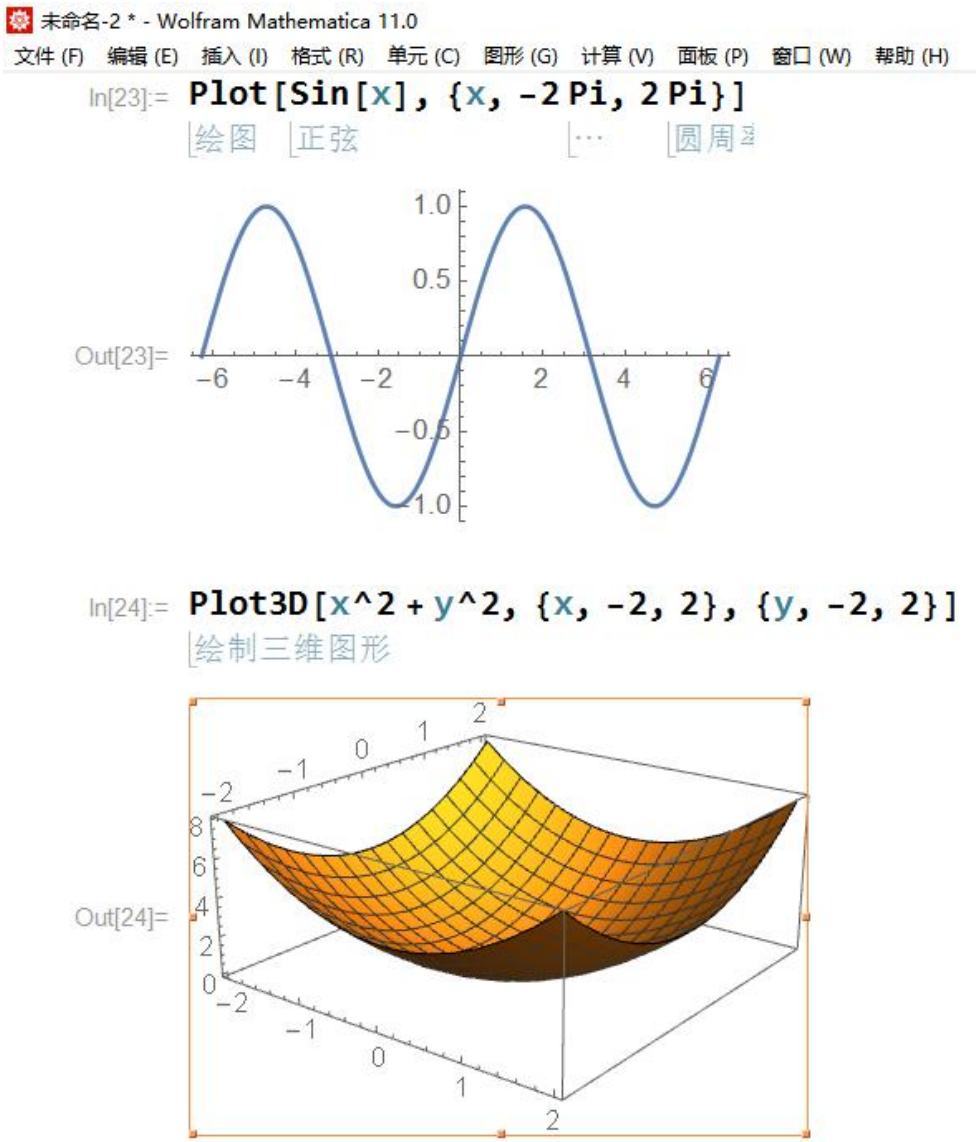
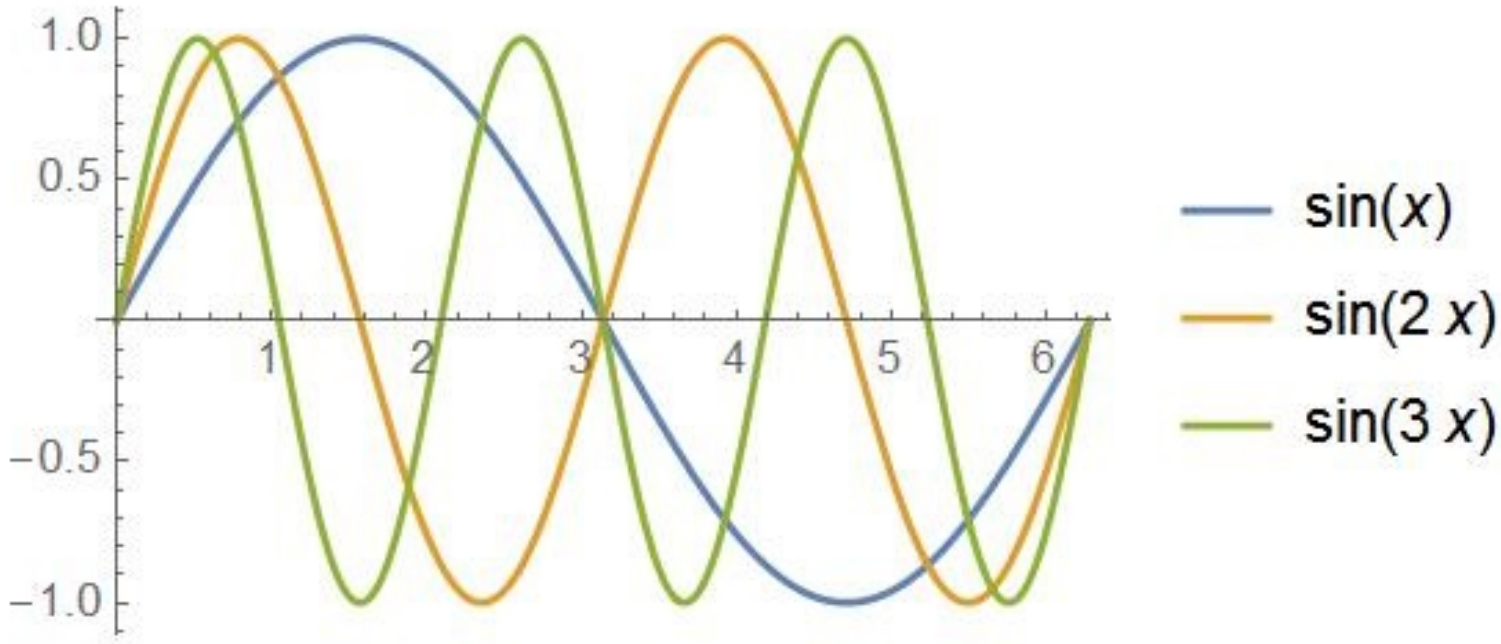


Data and function visualization and animation tools

```
In[25]:= Plot[{Sin[x], Sin[2 x], Sin[3 x]}, {x, 0, 2 Pi},
          绘图   正弦      正弦      正弦          圆周
         PlotLegends → "Expressions"]
                        绘图的图例
```

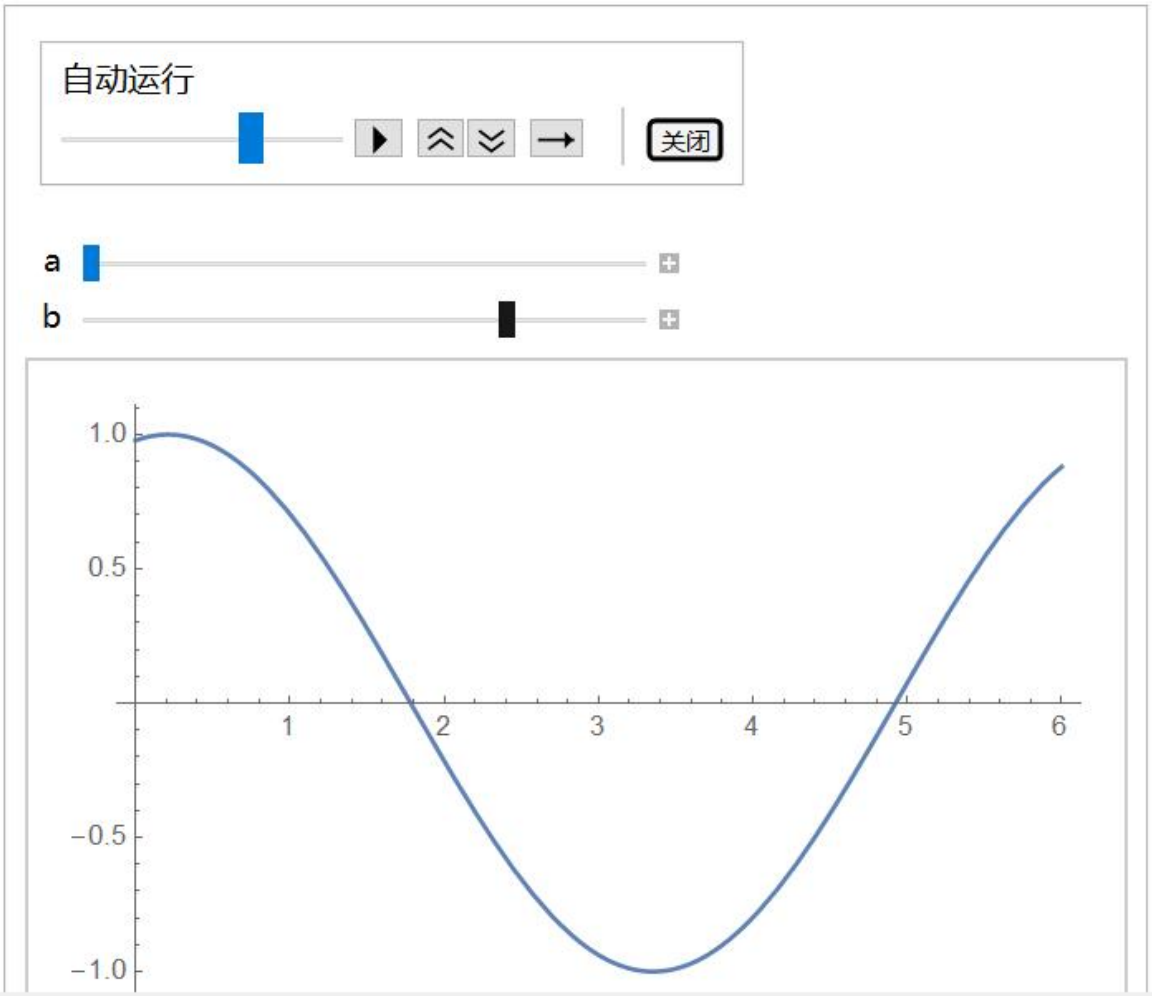
Out[25]=



Data and function visualization and animation tools

In[37]:=
```
Manipulate[Plot[Sin[a x + b], {x, 0, 6}], {a, 1, 4}, {b, 0, 10}]
```
交互式操作 | 绘图 | 正弦

Out[37]=



Linear and non-linear control system libraries

Linear and non-linear control system libraries

In[62]:=
```
Maximize[{x1 + x2, 2 x1 + x2 <= 2, x1 + 2 x2 <= 2}, {x1, x2}]
```
最大点值

Out[62]= $\left\{\frac{4}{3}, \left\{x1 \to \frac{2}{3}, x2 \to \frac{2}{3}\right\}\right\}$

Linear and non-linear control system libraries

```
In[65]:= Maximize[{x1 + x2, 2 x1 + x2 <= 2, x1 + 2 x2 <= 2, Element[{x1, x2}, Integers]},
          {x1, x2}]

Out[65]= {1, {x1 → 1, x2 → 0}}
```

Linear and non-linear control system libraries

In[68]:=
```
Minimize[{Sqrt[x^2 + y^2], (x - 2)^2 + (y - 1)^2 == 2}, {x, y}]
```
最小点值　平方根

Out[68]=
$$\left\{\sqrt{7-2\sqrt{10}}\,,\left\{x\to\frac{1}{5}\left(10-2\sqrt{10}\right)+\frac{1}{5}\sqrt{9-14\left(7-2\sqrt{10}\right)+\left(7-2\sqrt{10}\right)^2}\,,\right.\right.$$
$$\left.\left.y\to 1-\sqrt{\left(-2+4\left(\frac{1}{5}\left(10-2\sqrt{10}\right)+\frac{1}{5}\sqrt{9-14\left(7-2\sqrt{10}\right)+\left(7-2\sqrt{10}\right)^2}\right)-\left(\frac{1}{5}\left(10-2\sqrt{10}\right)+\frac{1}{5}\sqrt{9-14\left(7-2\sqrt{10}\right)+\left(7-2\sqrt{10}\right)^2}\right)^2\right)}\right\}\right\}$$

In[69]:=
```
Simplify[%]
```
化简

Out[69]=
$$\left\{\sqrt{7-2\sqrt{10}}\,,\left\{x\to 2-2\sqrt{\frac{2}{5}}\,,y\to 1-\sqrt{\frac{2}{5}}\right\}\right\}$$

Calculate the sum of prime numbers below 100

Calculate the sum of prime numbers below 100

```
In[87]:= s = 0;
         t = 1;
         For[i = 1, i ≤ 100, i++, If[PrimeQ[i], s = s + i; t = t * i]]
         For循环                    素数判定
         Print["s=", s]
         打印
         Print["t=", t]
         打印

         s=1060

         t=2 305 567 963 945 518 424 753 102 147 331 756 070
```

An easy parallel programming tool

An easy parallel programming tool

```
In[101]:= Table[PrimeQ[x], {x, 10^1000, 10^1000 + 10000}]; // AbsoluteTiming
          |表格   |素数判定                                          |绝对时间

Out[101]= {16.4827, Null}

In[100]:= Parallelize[Table[PrimeQ[x], {x, 10^1000, 10^1000 + 10000}]]; // AbsoluteTiming
          |并行运行      |表格   |素数判定                                    |绝对时间

Out[100]= {10.5805, Null}
```

More Features

More Features

- Supervised and unsupervised machine learning tools for data, images and sounds including artificial neural networks
- Tools for 2D and 3D image processing and morphological image processing including image recognition
- Tools for visualizing and analysing graphs
- Tools to connect to dynamic-link library, SQL, Java, .NET, C++, Fortran, CUDA, OpenCL, and HTTP based systems
- Tools for financial calculations
- ...

Overview

My Opinions

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- Advantages
  - Easy to use
  - Powerful
  - Friendly interface
  - ...

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  - Expensive?

Conclusion

Choose the best tool for your work!

Thanks!