

In[1]:= **3 ^ 100**

Out[1]= 515 377 520 732 011 331 036 461 129 765 621 272 702 107 522 001

In[2]:= **3 ^ 1000**

Out[2]= 1 322 070 819 480 806 636 890 455 259 752 144 365 965 422 032 752 148 167 664 920 368 226 828 3
597 346 704 899 540 778 313 850 608 061 963 909 777 696 872 582 355 950 954 582 100 618 911 3
865 342 725 257 953 674 027 620 225 198 320 803 878 014 774 228 964 841 274 390 400 117 588 3
618 041 128 947 815 623 094 438 061 566 173 054 086 674 490 506 178 125 480 344 405 547 054 3
397 038 895 817 465 368 254 916 136 220 830 268 563 778 582 290 228 416 398 307 887 896 918 3
556 404 084 898 937 609 373 242 171 846 359 938 695 516 765 018 940 588 109 060 426 089 671 3
438 864 102 814 350 385 648 747 165 832 010 614 366 132 173 102 768 902 855 220 001

In[3]:= **N[%]**

[数值运算](#)

Out[3]= $1.322070819480807 \times 10^{477}$

In[4]:= **pi = N[Pi, 200]**

[\[· · 圆周率\]](#)

Out[4]= 3.14159265358979323846264338327950288419716939937510582097494459230781640628623
089986280348253421170679821480865132823066470938446095505822317253594081284813
1174502841027019385211055596446229489549303820

In[5]:= **Exp[Sqrt[163] * pi / 3]**

[\[· · · 平方根\]](#)

Out[5]= 640 320.000000000604863735049016039471741818818539475771485760366591819465221823
582869425363408158226464775899925470001727925679647867303997506923198495665263
126939682656133891371344182490197233443309599

In[6]:= **piString = ToString[N[Pi, 1000]];**

[转换为· · ·](#) [\[· · 圆周率\]](#)

trimmedString = StringDrop[piString, 2];

[删除指定位置的字符](#)

position = StringPosition[trimmedString, "999999"]

[字符串位置](#)

Out[8]= {{ 762, 767 }}

In[9]:= **Sin[3 Pi]**

[正弦](#) [\[圆周率\]](#)

Log[2.1]

[对数](#)

Exp[I * Pi]

[\[· · · 圆周率\]](#)

Out[9]= 0

Out[10]=

0.741937

Out[11]=

- 1

In[12]:= **TrigReduce[Cos[Pi / 5]]**
[三角函数约化](#) [余弦](#) [圆周率](#)

Out[12]=

$$\frac{1}{4} (1 + \sqrt{5})$$

In[13]:= **FactorInteger[70 612 139 395 722 186]**
[整数因子分解](#)

Out[13]=

$$\{\{2, 1\}, \{3, 2\}, \{43, 5\}, \{26\,684\,839, 1\}\}$$

In[14]:= **Times@@Power@@@%**
[乘](#) [幂](#)

Out[14]=
 70 612 139 395 722 186

In[15]:= **(x^2 + 2 x + 1)^20**

Out[15]=

$$(1 + 2 x + x^2)^{20}$$

In[20]:= **Expand[(1 + 2 x + x^2)^20]**
[展开](#)

Out[20]=

$$\begin{aligned} &1 + 40 x + 780 x^2 + 9880 x^3 + 91\,390 x^4 + 658\,008 x^5 + 3\,838\,380 x^6 + 18\,643\,560 x^7 + \\ &76\,904\,685 x^8 + 273\,438\,880 x^9 + 847\,660\,528 x^{10} + 2\,311\,801\,440 x^{11} + 5\,586\,853\,480 x^{12} + \\ &12\,033\,222\,880 x^{13} + 23\,206\,929\,840 x^{14} + 40\,225\,345\,056 x^{15} + 62\,852\,101\,650 x^{16} + \\ &88\,732\,378\,800 x^{17} + 113\,380\,261\,800 x^{18} + 131\,282\,408\,400 x^{19} + 137\,846\,528\,820 x^{20} + \\ &131\,282\,408\,400 x^{21} + 113\,380\,261\,800 x^{22} + 88\,732\,378\,800 x^{23} + 62\,852\,101\,650 x^{24} + \\ &40\,225\,345\,056 x^{25} + 23\,206\,929\,840 x^{26} + 12\,033\,222\,880 x^{27} + 5\,586\,853\,480 x^{28} + \\ &2\,311\,801\,440 x^{29} + 847\,660\,528 x^{30} + 273\,438\,880 x^{31} + 76\,904\,685 x^{32} + 18\,643\,560 x^{33} + \\ &3\,838\,380 x^{34} + 658\,008 x^{35} + 91\,390 x^{36} + 9880 x^{37} + 780 x^{38} + 40 x^{39} + x^{40} \end{aligned}$$

In[19]:= **Expand[%]**
[展开](#)

Out[19]=

$$\begin{aligned} &1 + 40 x + 780 x^2 + 9880 x^3 + 91\,390 x^4 + 658\,008 x^5 + 3\,838\,380 x^6 + 18\,643\,560 x^7 + \\ &76\,904\,685 x^8 + 273\,438\,880 x^9 + 847\,660\,528 x^{10} + 2\,311\,801\,440 x^{11} + 5\,586\,853\,480 x^{12} + \\ &12\,033\,222\,880 x^{13} + 23\,206\,929\,840 x^{14} + 40\,225\,345\,056 x^{15} + 62\,852\,101\,650 x^{16} + \\ &88\,732\,378\,800 x^{17} + 113\,380\,261\,800 x^{18} + 131\,282\,408\,400 x^{19} + 137\,846\,528\,820 x^{20} + \\ &131\,282\,408\,400 x^{21} + 113\,380\,261\,800 x^{22} + 88\,732\,378\,800 x^{23} + 62\,852\,101\,650 x^{24} + \\ &40\,225\,345\,056 x^{25} + 23\,206\,929\,840 x^{26} + 12\,033\,222\,880 x^{27} + 5\,586\,853\,480 x^{28} + \\ &2\,311\,801\,440 x^{29} + 847\,660\,528 x^{30} + 273\,438\,880 x^{31} + 76\,904\,685 x^{32} + 18\,643\,560 x^{33} + \\ &3\,838\,380 x^{34} + 658\,008 x^{35} + 91\,390 x^{36} + 9880 x^{37} + 780 x^{38} + 40 x^{39} + x^{40} \end{aligned}$$

In[24]:= **TrigReduce[Sin[x] Cos[y] - Cos[x] Sin[y]]**
[三角函数约化](#) [正弦](#) [余弦](#) [余弦](#) [正弦](#)

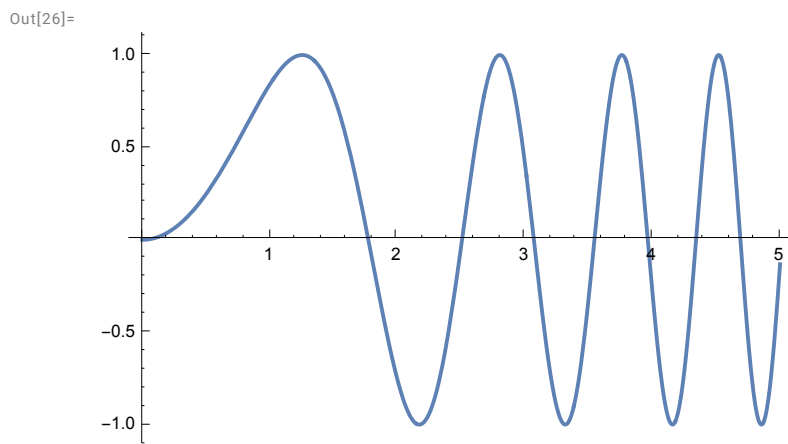
Out[24]=

$$\sin[x - y]$$

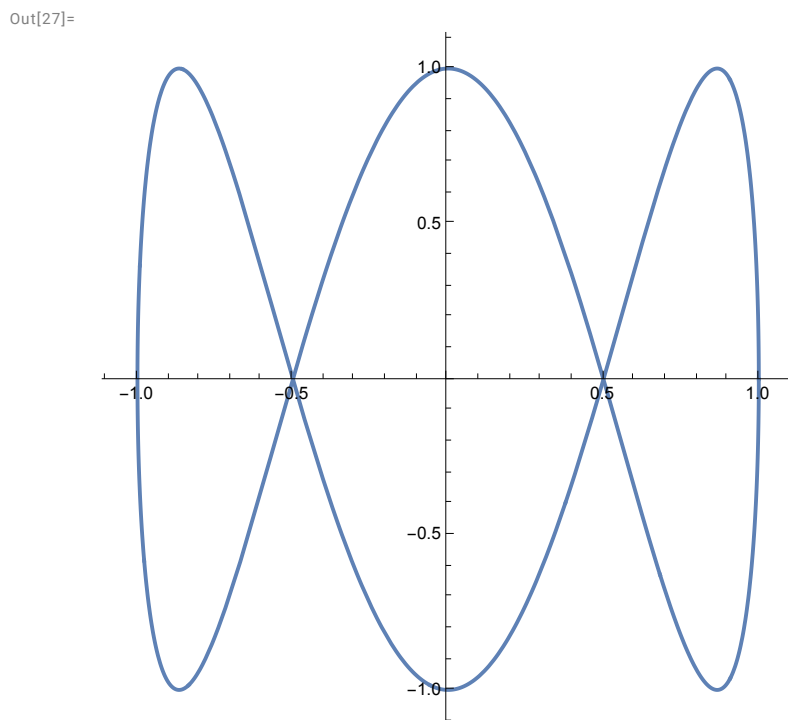
In[25]:= **TrigExpand[%]**
[三角函数展开](#)

Out[25]=
 $\cos[y] \sin[x] - \cos[x] \sin[y]$

In[26]:= **Plot[Sin[x^2], {x, 0, 5}]**
[绘图](#) [正弦](#)



In[27]:= **ParametricPlot[{Cos[x], Sin[3 x]}, {x, 0, 2 Pi}]**
[绘制参数图](#) [余弦](#) [正弦](#) [圆周率](#)



```
In[28]:= ContourPlot[x Exp[-x^2 - y^2], {x, -1, 1}, {y, -1, 1}]
```

绘制等高线

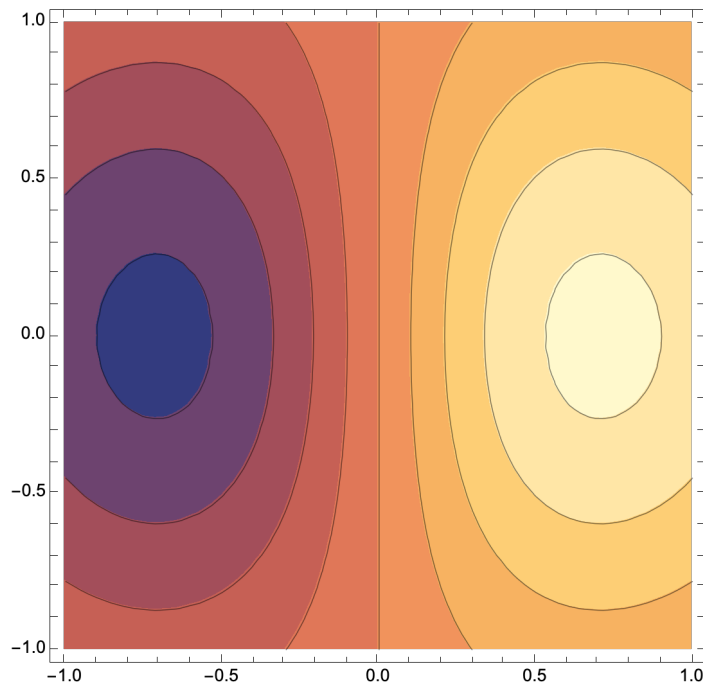
指数形式

```
DensityPlot[x Exp[-x^2 - y^2], {x, -1, 1}, {y, -1, 1}]
```

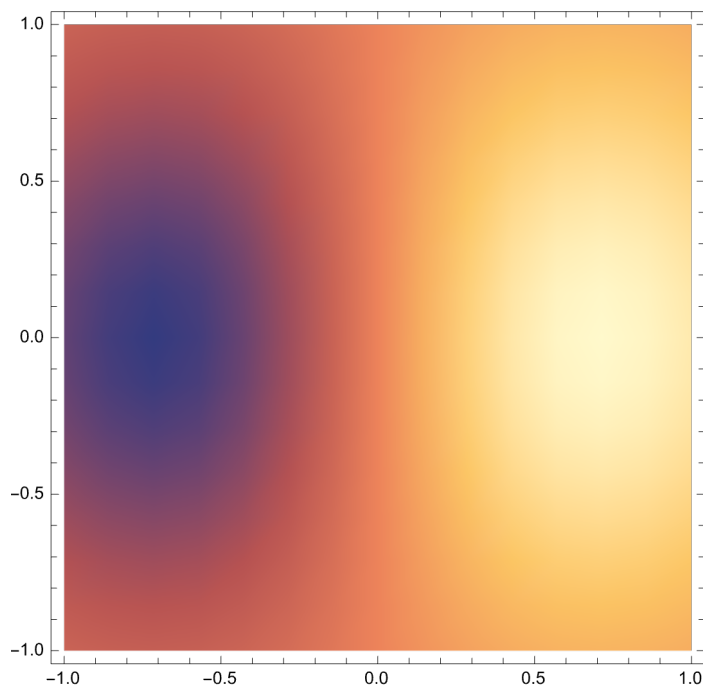
密度图

指数形式

Out[28]=



Out[29]=



In[30]:= **integral = Integrate**[x / (x^3 - 1), x]
[积分]

simplified = Simplify[D[integral, x]]
[化简] [偏导]

Out[30]=

$$\frac{\text{ArcTan}\left[\frac{1+2x}{\sqrt{3}}\right]}{\sqrt{3}} + \frac{1}{3} \text{Log}[1-x] - \frac{1}{6} \text{Log}[1+x+x^2]$$

Out[31]=

$$\frac{x}{-1+x^3}$$

In[34]:= **Integrate**[Sin[x]^2 Cos[x]^3 / x, {x, 0, Infinity}]
[积分] [正弦] [余弦] [无穷大]

Out[34]=

$$\frac{\text{Log}[15]}{16}$$

In[35]:= **Integrate**[Sin[Sin[x]], {x, 0, 1}]
[积分] [正弦] [正弦]

Out[35]=

$$\int_0^1 \text{Sin}[\text{Sin}[x]] \, dx$$

In[36]:= **N**[%]
[数值运算]

Out[36]=
0.430606

In[37]:= **NIntegrate**[Sin[Sin[x]], {x, 0, 1}]
[数值积分] [正弦] [正弦]

Out[37]=
0.430606

In[42]:= **s = Solve**[a x^2 + b x + c == 0, x]
[解方程]
backSubstitution = Simplify[a x^2 + b x + c /. s]
[化简]

Out[42]=

$$\left\{ \left\{ x \rightarrow \frac{-b - \sqrt{b^2 - 4ac}}{2a} \right\}, \left\{ x \rightarrow \frac{-b + \sqrt{b^2 - 4ac}}{2a} \right\} \right\}$$

Out[43]=
{0, 0}

In[44]:= **solutions = Solve**[x^3 - x + 1 == 0, x]
[解方程]
numericSolutions = N[x /. solutions]
[数值运算]

Out[44]=

$$\left\{ \left\{ x \rightarrow \sqrt[3]{-1.32...} \right\}, \left\{ x \rightarrow \sqrt[3]{0.662... - 0.562... i} \right\}, \left\{ x \rightarrow \sqrt[3]{0.662... + 0.562... i} \right\} \right\}$$

Out[45]=
{-1.32472, 0.662359 - 0.56228 i, 0.662359 + 0.56228 i}

```
In[49]:= mat =  $\begin{pmatrix} 3.5 & 7.2 \\ -2.4 & 6.4 \end{pmatrix}$ 
```

```
inverse = Inverse[mat]
```

[\[逆\]](#)

```
eigenvalues = Eigenvalues[mat]
```

[\[特征值\]](#)

```
Out[49]=
```

```
 $\{\{3.5, 7.2\}, \{-2.4, 6.4\}\}$ 
```

```
Out[50]=
```

```
 $\{\{0.16129, -0.181452\}, \{0.0604839, 0.0882056\}\}$ 
```

```
Out[51]=
```

```
 $\{4.95 + 3.89583 i, 4.95 - 3.89583 i\}$ 
```

```
In[52]:= mat = {{a, b, c}, {d, e, f}, {g, h, i}}
```

```
minv = Inverse[mat]
```

[\[逆\]](#)

```
result = Simplify[minv.mat]
```

[\[化简\]](#)

```
Out[52]=
```

```
 $\{\{a, b, c\}, \{d, e, f\}, \{g, h, i\}\}$ 
```

```
Out[53]=
```

$$\left\{ \left\{ \frac{-f h + e i}{-c e g + b f g + c d h - a f h - b d i + a e i}, \frac{c h - b i}{-c e g + b f g + c d h - a f h - b d i + a e i}, \frac{-c e + b f}{-c e g + b f g + c d h - a f h - b d i + a e i} \right\}, \right. \\ \left. \left\{ \frac{f g - d i}{-c e g + b f g + c d h - a f h - b d i + a e i}, \frac{-c g + a i}{-c e g + b f g + c d h - a f h - b d i + a e i}, \frac{c d - a f}{-c e g + b f g + c d h - a f h - b d i + a e i} \right\}, \right. \\ \left. \left\{ \frac{-e g + d h}{-c e g + b f g + c d h - a f h - b d i + a e i}, \frac{b g - a h}{-c e g + b f g + c d h - a f h - b d i + a e i}, \frac{-b d + a e}{-c e g + b f g + c d h - a f h - b d i + a e i} \right\} \right\}$$

```
Out[54]=
```

```
 $\{\{1, 0, 0\}, \{0, 1, 0\}, \{0, 0, 1\}\}$ 
```

```
In[63]:= rand = RandomReal[{-1, 1}, {3, 3}]
```

⌈伪随机实数

```
rand[[2, 2]] = x;
```

```
inverse = Inverse[rand]
```

⌈逆

```
numericalInverse = inverse /. x -> 1
```

```
Out[63]=
```

```
{{0.457812, -0.527412, 0.498019},
 {0.0156287, 0.144422, 0.149473}, {0.151936, -0.291652, -0.895679}}
```

```
Out[65]=
```

$$\left\{ \left\{ \frac{0.0435943 - 0.895679 x}{-0.00167269 - 0.48572 x}, -\frac{0.617641}{-0.00167269 - 0.48572 x}, \frac{-0.0788342 - 0.498019 x}{-0.00167269 - 0.48572 x} \right\}, \right.$$

$$\left\{ \frac{0.0367088}{-0.00167269 - 0.48572 x}, -\frac{0.48572}{-0.00167269 - 0.48572 x}, -\frac{0.0606474}{-0.00167269 - 0.48572 x} \right\},$$

$$\left. \left\{ \frac{-0.00455815 - 0.151936 x}{-0.00167269 - 0.48572 x}, \frac{0.053389}{-0.00167269 - 0.48572 x}, \frac{0.00824278 + 0.457812 x}{-0.00167269 - 0.48572 x} \right\} \right\}$$

```
Out[66]=
```

```
{{1.74825, 1.26723, 1.18355},
 {-0.0753166, 0.996568, 0.124432}, {0.321085, -0.10954, -0.956221}}
```

```
In[67]:= is = Table[i!, {i, 1, 10}]
```

⌈表格

```
Out[67]=
```

```
{1, 2, 6, 24, 120, 720, 5040, 40320, 362880, 3628800}
```

```
In[68]:= data = N[Log[is]]
```

⌈对数

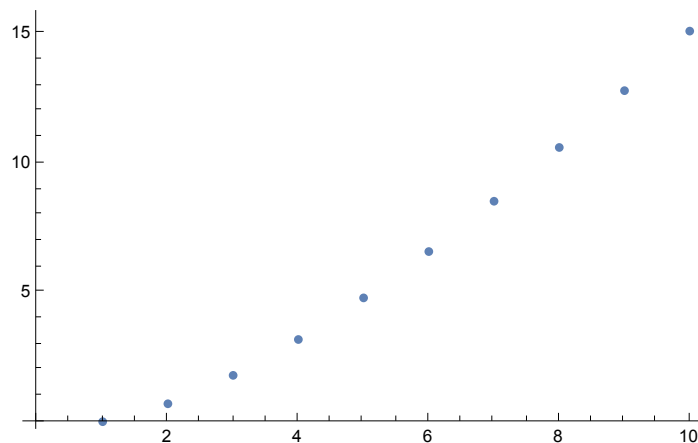
```
Out[68]=
```

```
{0., 0.693147, 1.79176, 3.17805, 4.78749,
 6.57925, 8.52516, 10.6046, 12.8018, 15.1044}
```

```
In[69]:= p1 = ListPlot[data]
```

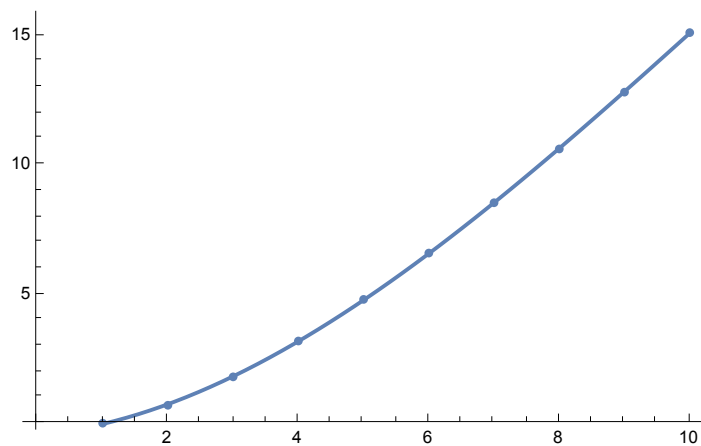
⌈绘制点集

```
Out[69]=
```



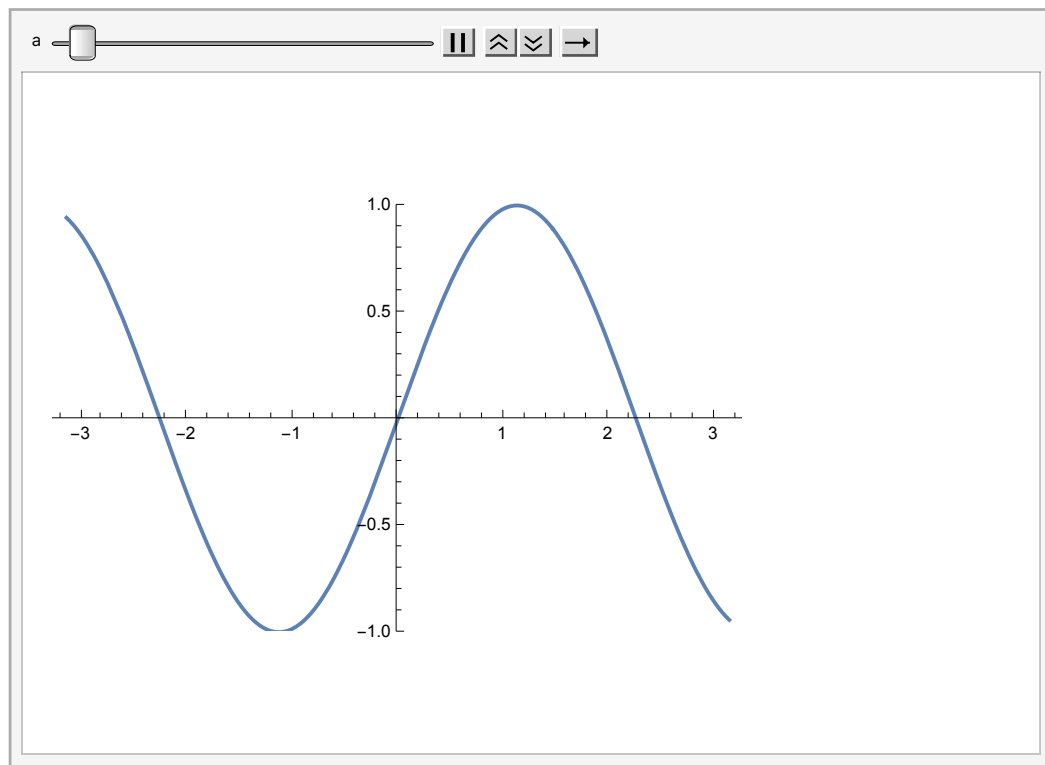
```
In[91]:= fit = Fit[data, {1, x, x^2, x^3}, x];
          拟合
p2 = Plot[fit, {x, 1, 10}, PlotRange -> All];
          绘图          绘制范围          全部
Show[p1, p2]
          显示
```

Out[93]=

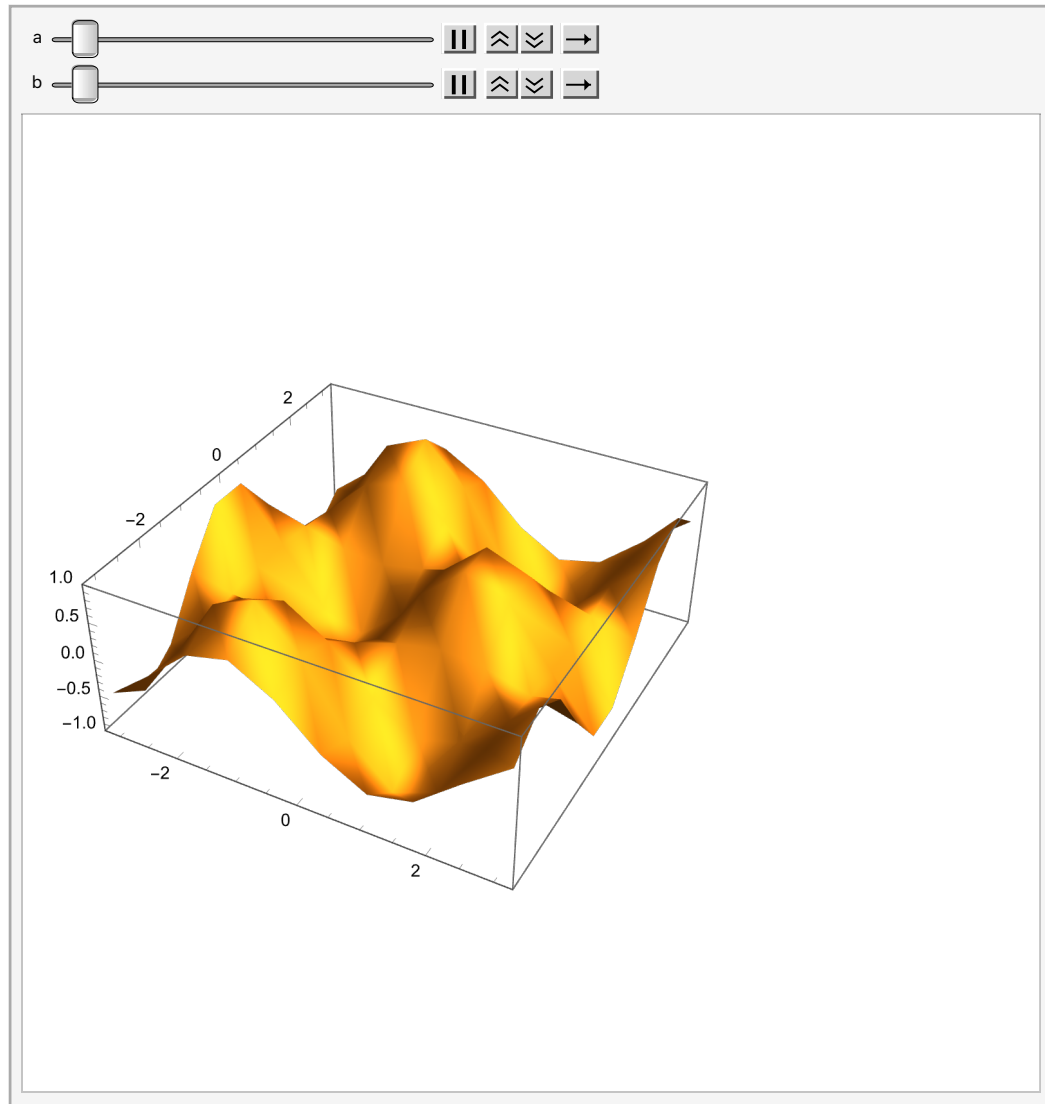


```
In[94]:= Animate[Plot[Sin[a x], {x, -Pi, Pi}, PlotRange -> {-1, 1}], {a, 1, 5}]
          生成动画  绘图  正弦          ...  ...  绘制范围
Animate[Plot3D[Sin[a x] Cos[b y], {x, -Pi, Pi},
          生成动画  绘制...  正弦  余弦          ...  圆周率
          {y, -Pi, Pi}, PlotRange -> {-1, 1}], {a, 1, 5}, {b, 1, 5}]
          ...  ...  绘制范围
```

Out[94]=



Out[95]=



In[116]:=

```

img = Import["/Users/qiu_nangong/Documents/GitHub/Mathematica/image.png"];
(*Load the image*)
grayImg = ColorConvert[img, "Grayscale"]; (*Convert to grayscale*)
blurredImg = GaussianFilter[grayImg, 5]; (*Apply Gaussian blur*)
adjustedImg = ImageAdjust[blurredImg, {0.5, 0.5}];
edges = EdgeDetect[adjustedImg]; (*Perform edge detection*)

```

In[121]:=

%116

Out[121]=

