

变换

先看看相关的基础函数

```
In[ ]:= a = {x, y, z};  
           $\sqrt{\text{Dot}[a, a]}$   
          Abs[a]  
          |绝对值  
          Norm[a]  
          |模  
          Norm[a] // FullSimplify  
          |模 |完全简化  
          EuclideanDistance[{0, 0, 0}, a]  
          |欧几里得距离
```

```
Out[ ]:=  
 $\sqrt{x^2 + y^2 + z^2}$ 
```

```
Out[ ]:=  
{Abs[x], Abs[y], Abs[z]}
```

```
Out[ ]:=  
 $\sqrt{\text{Abs}[x]^2 + \text{Abs}[y]^2 + \text{Abs}[z]^2}$ 
```

```
Out[ ]:=  
 $\sqrt{\text{Abs}[x]^2 + \text{Abs}[y]^2 + \text{Abs}[z]^2}$ 
```

```
Out[ ]:=  
 $\sqrt{\text{Abs}[x]^2 + \text{Abs}[y]^2 + \text{Abs}[z]^2}$ 
```

绘制直线根据函数变换的结果

```

In[ ]:= plot[f_, r_ : {-1.5, 1.2}] := Block[{c, l},
    c = ParametricPlot[{Cos[t], Sin[t]}, {t, 0, 2 π}];
    l = ParametricPlot[{t, f[t]}, {t, -1.5, 1.2}];
    (*Join[{t}, r] *) (*{t, Sequence@@r} *) (*必须使用Evaluate*)
    Evaluate[{t, Splice@r}, PlotStyle -> {Pink, Magenta}];
    Show[c, l, PlotRange -> 1.2]

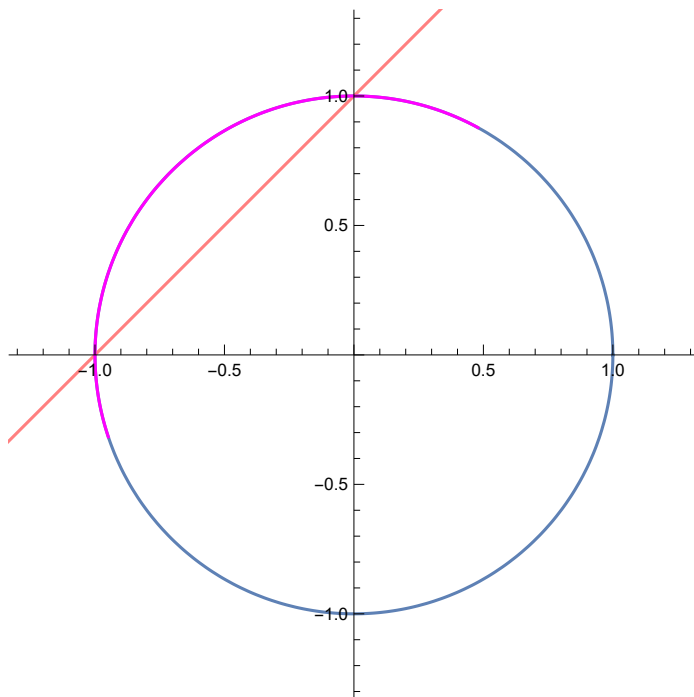
```

```

plot[Normalize]

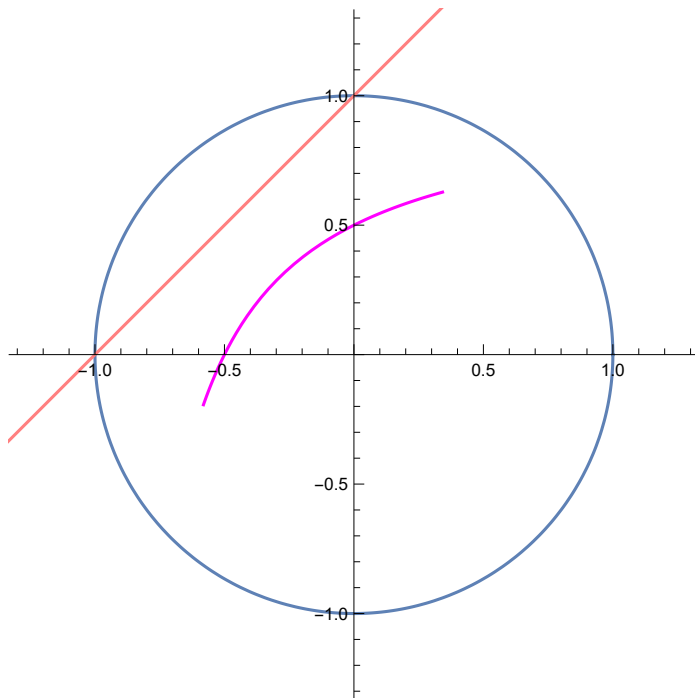
```

Out[]:=



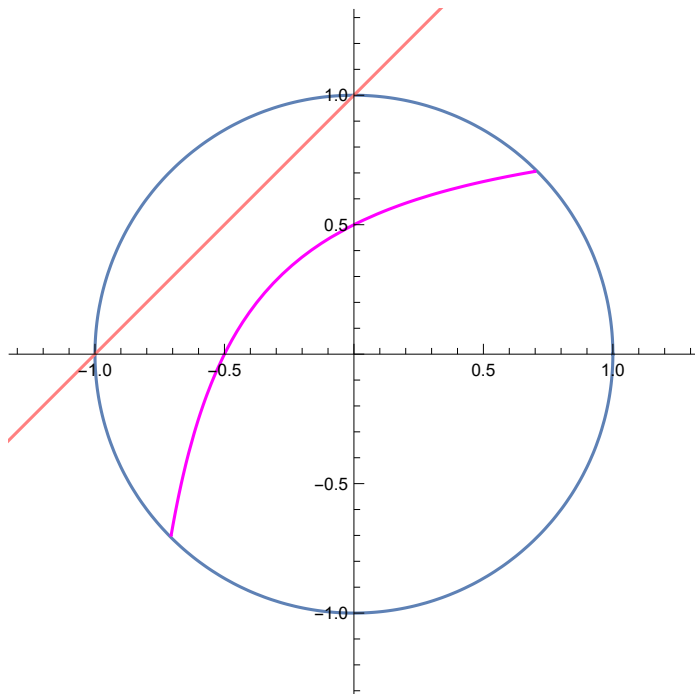
In[*]:= `plot[$\frac{\#}{1 + \text{Norm}[\#]}$ &]`

Out[*]=



In[*]:= `plot[$\frac{\#}{1 + \text{Norm}[\#]}$ &, {-100, 100}]`

Out[*]=

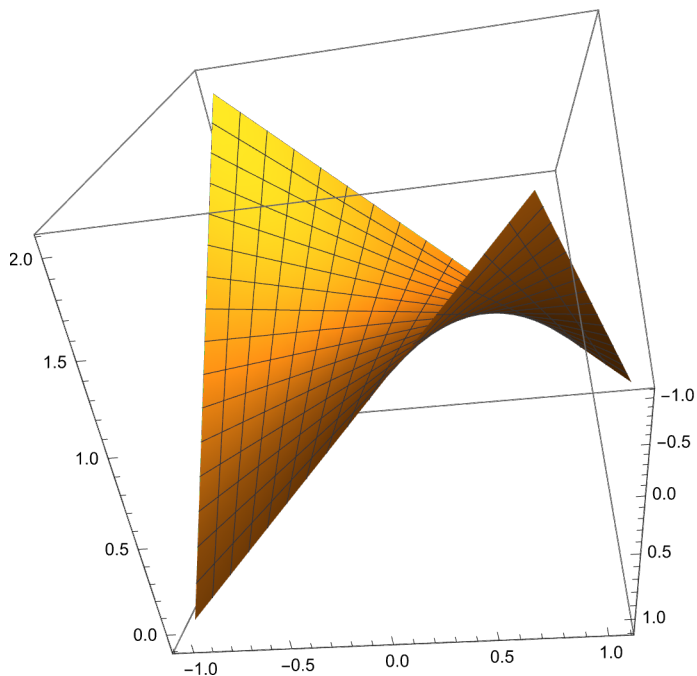


明白了以上变换过程后，我们看看3D空间中的曲面

```
In[ ]:= ParametricPlot3D[{x, y, x y + 1}, {x, -1, 1}, {y, -1, 1}]
```

[绘制三维参数图](#)

Out[]:=

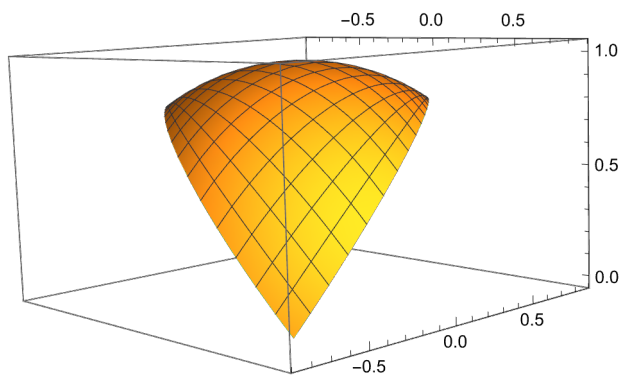


```
In[ ]:= ParametricPlot3D[Normalize @ {x, y, x y + 1}, {x, -1, 1}, {y, -1, 1}]
```

[绘制三维参数图](#)

[正规化](#)

Out[]:=



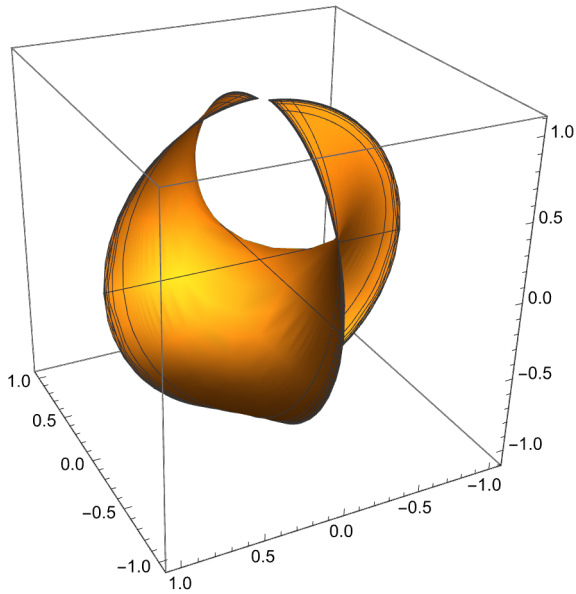
```

In[ ]:= ParametricPlot3D[ $\frac{\#}{1 + \text{Norm}[\#]}$  & @ {x, y, x y},
|绘制三维参数图

{x, -50, 50}, {y, -50, 50}, PlotRange → All, PlotPoints → 100]
|绘制范围 |全部 |绘图点

```

Out[]:=



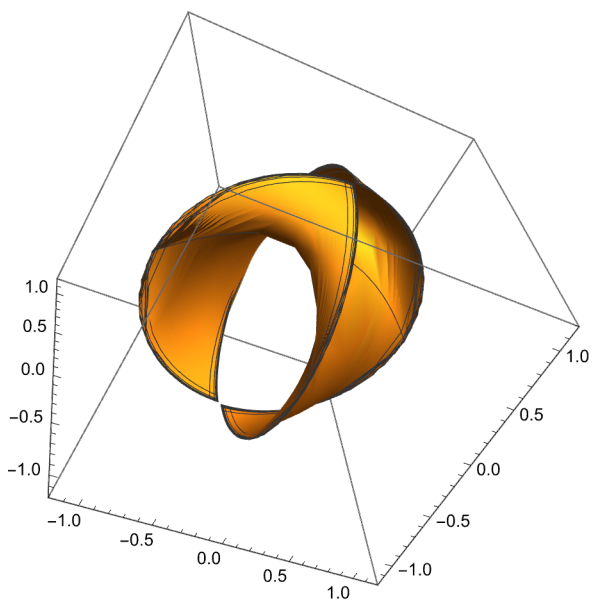
```

In[ ]:= ParametricPlot3D[ $\frac{\#}{1 + \text{Norm}[\#]}$  & @ {100 x, 100 y, 10^4 x y + 1},
|绘制三维参数图

{x, -1, 1}, {y, -1, 1}, PlotRange → 1.2, PlotPoints → 100]
|绘制范围 |绘图点

```

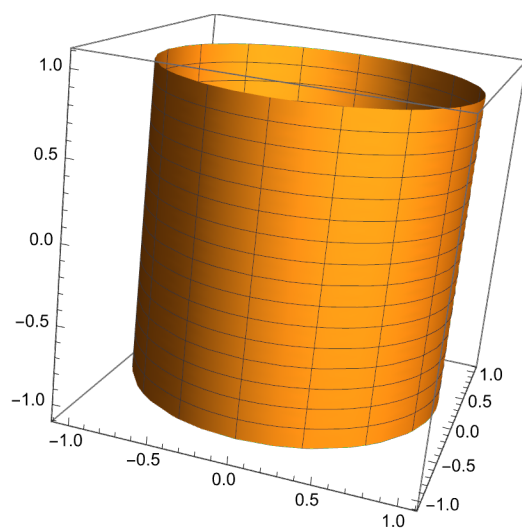
Out[]:=



```
In[ ]:= ParametricPlot3D[{Cos[u], Sin[u], v}, {u, 0, 2  $\pi$ }, {v, -1, 1}]
```

[绘制三维参数图](#) [余弦](#) [正弦](#)

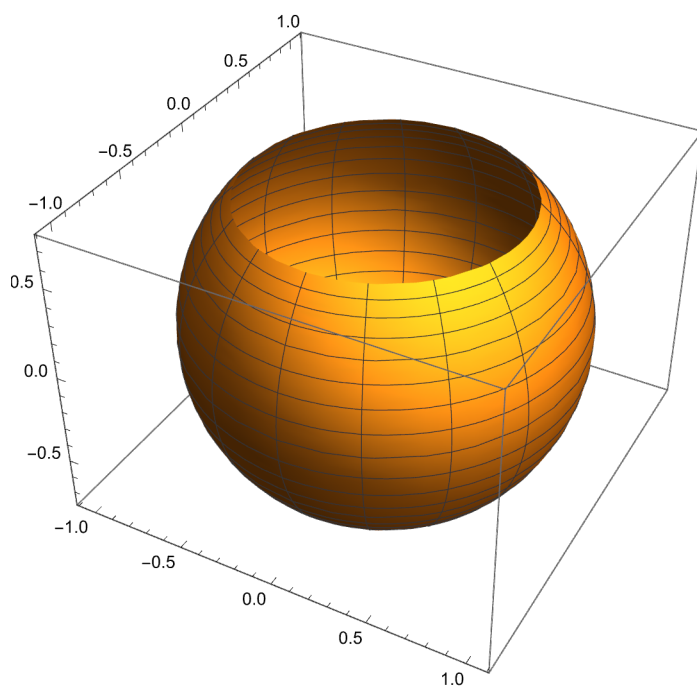
```
Out[ ]:=
```



```
In[ ]:= ParametricPlot3D[Normalize @ {Cos[u], Sin[u], v}, {u, 0, 2  $\pi$ }, {v, -1, 1}]
```

[绘制三维参数图](#) [正规化](#) [余弦](#) [正弦](#)

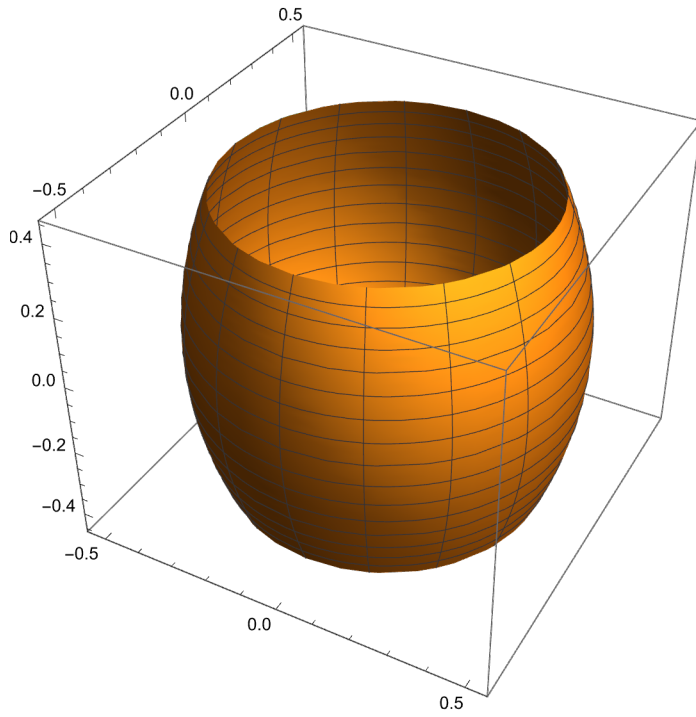
```
Out[ ]:=
```



```
In[*]:= ParametricPlot3D[ $\frac{\#}{1 + \text{Norm}[\#]}$  & @ {Cos[u], Sin[u], v}, {u, 0, 2  $\pi$ }, {v, -1, 1}]
```

绘制三维参数图 余弦 正弦

Out[*]=

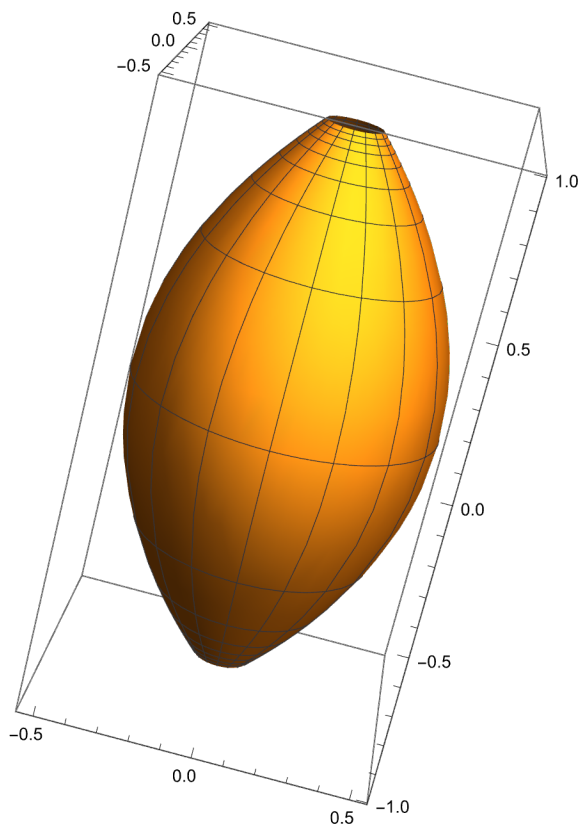


```

In[*]:= ParametricPlot3D[ $\frac{\#}{1 + \text{Norm}[\#]}$  & @ {Cos[u], Sin[u], v},
  绘制三维参数图      余弦      正弦
  {u, 0, 2  $\pi$ }, {v, -10, 10}, PlotRange  $\rightarrow$  All, PlotPoints  $\rightarrow$  33]
  绘制范围      全部 绘图点

```

Out[*]=

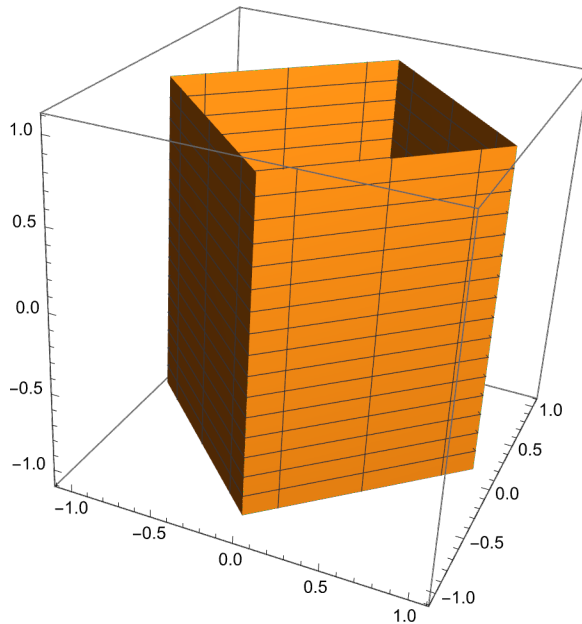



```

In[ ]:= (*{Abs@Cos[u] Cos[u], Abs@Sin[u] Sin[u], v}*)
[... 余弦 余弦 ... 正弦 正弦]
ParametricPlot3D[{Sign@Cos[u] Cos[u]^2, Sign@Sin[u] Sin[u]^2, v},
[绘制三维参数图] [正... 余弦] [正... 正弦]
{u, 0, 2 π}, {v, -1, 1}, PlotRange → All, PlotPoints → 33]
[绘制范围] [全部] [绘图点]

```

Out[]:=

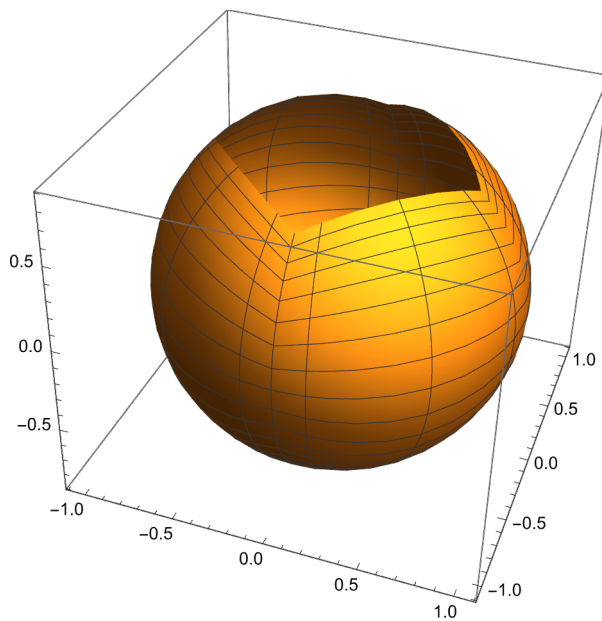


```

In[ ]:= ParametricPlot3D[Normalize@{Abs@Cos[u] Cos[u], Abs@Sin[u] Sin[u], v},
[绘制三维参数图] [正规化] [...] 余弦 余弦 [...] 正弦 正弦]
{u, 0, 2 π}, {v, -1, 1}, PlotRange → All, PlotPoints → 33]
[绘制范围] [全部] [绘图点]

```

Out[]:=



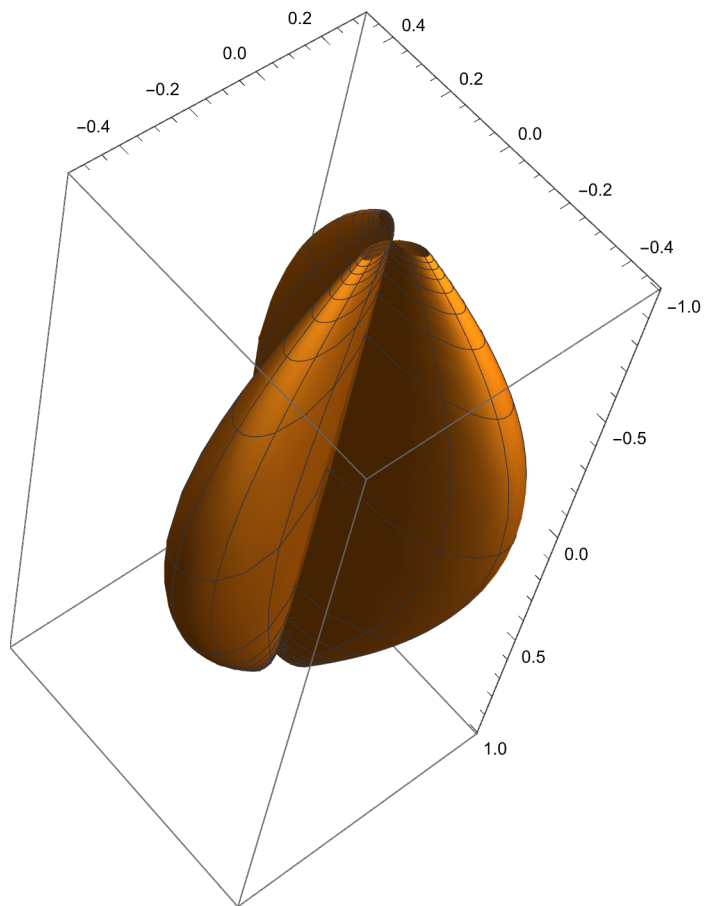
```

In[ ]:= ParametricPlot3D[ $\frac{\#1}{1 + \text{Norm}[\#1]}$  &@{Sin[3 u] Cos[u], Sin[3 u] Sin[u], v},
  绘制三维参数图      正弦      余弦      正弦      正弦

  {u, 0,  $\pi$ }, {v, -10, 10}, PlotRange  $\rightarrow$  All, PlotPoints  $\rightarrow$  33]
  绘制范围      全部      绘图点

```

Out[]:=

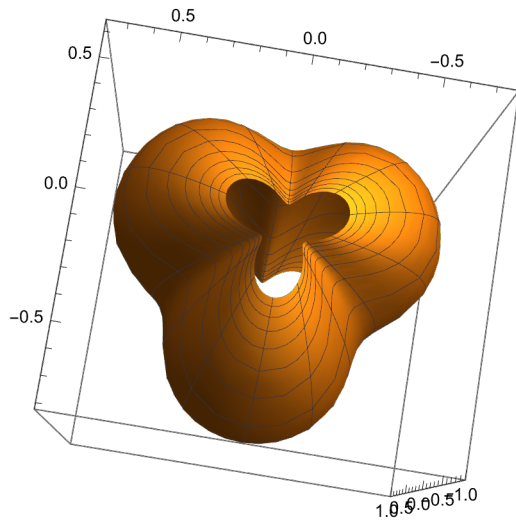


```

In[ ]:= ParametricPlot3D[ $\frac{\#1}{1 + \text{Norm}[\#1]}$  &@{ (Sin[3 u] + 2) Cos[u], (Sin[3 u] + 2) Sin[u], v},
|绘制三维参数图 |正弦 |余弦 |正弦 |正弦
{u, 0, 2  $\pi$ }, {v, -10, 10}, PlotRange -> All, PlotPoints -> 33]
|绘制范围 |全部 |绘图点

```

Out[]:=

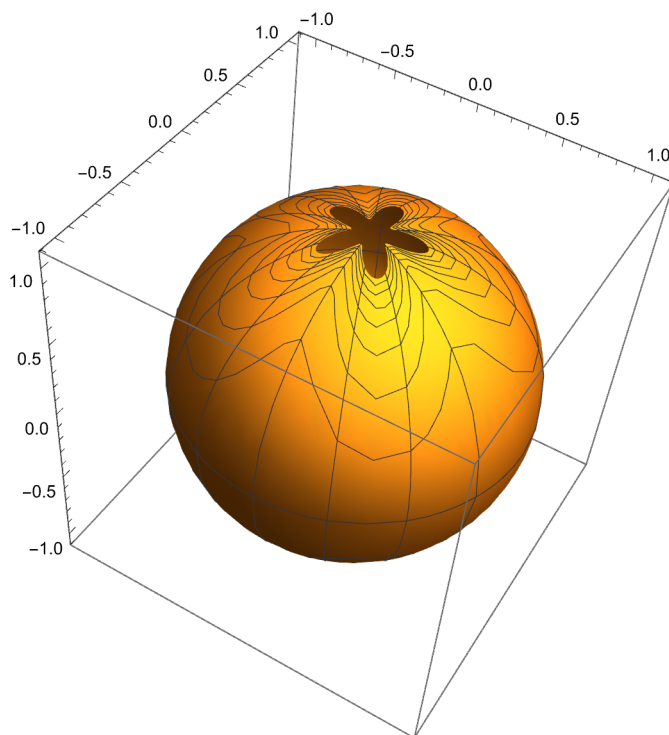


```

In[ ]:= ParametricPlot3D[Normalize@{ (Sin[5 u] + 2) Cos[u], (Sin[5 u] + 2) Sin[u], v},
|绘制三维参数图 |正规化 |正弦 |余弦 |正弦 |正弦
{u, 0, 2  $\pi$ }, {v, -10, 10}, PlotRange -> All, PlotPoints -> 33]
|绘制范围 |全部 |绘图点

```

Out[]:=



```

In[ ]:= Sin2[1.~]

```

Out[]:=

Sin²[1.]