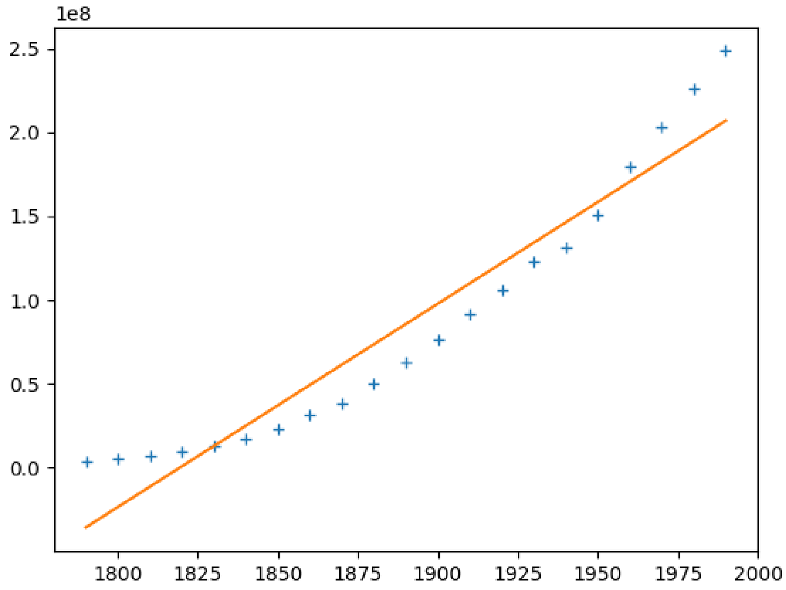
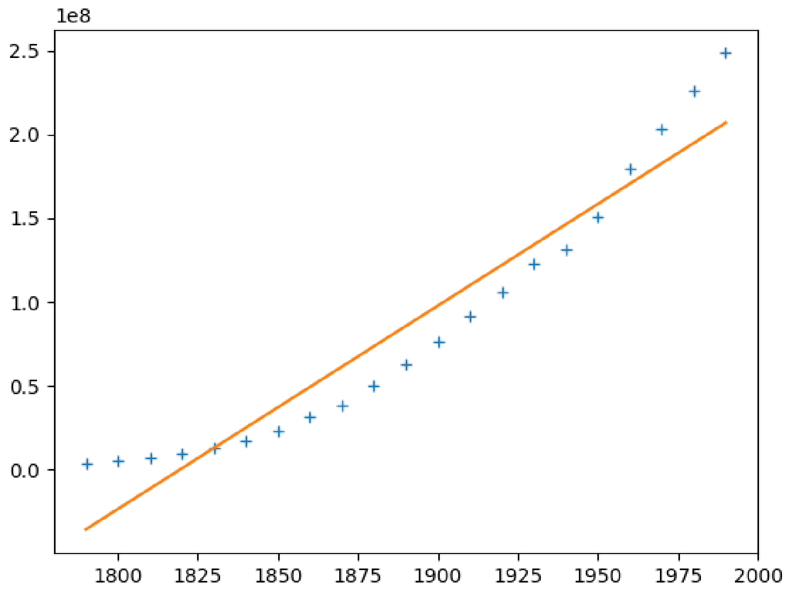
1.Python 实现相关功能

Listing 1: 1

```
import numpy as np
import matplotlib.pyplot as plt
import scipy
#1.1读取数据，并且转化为数组形式
data=np.loadtxt("C:\\Users\\70396\\Desktop\\uspop.txt")
print(data)
x=[]
y=[]
for i in range(0,len(data)):
    x.append(data[i,0])
    y.append(data[i,1])
x=np.array(x)
y=np.array(y)
#1.2线性回归
from scipy.stats import linregress
res = linregress(x, y)
plt.plot(x, y, '+')
plt.plot(x, res.intercept + res.slope * x)
plt.show()
#1.3曲线拟合
from scipy.optimize import curve_fit
def f(x, a, c):
    return a*(np.exp(c*x))
popt, pcov = curve_fit(f, x, y)
plt.plot(x, y, '+')
plt.plot(x, f(x,*popt))
plt.show()
#1.4曲线拟合的方式拟合直线
def f(t, a, c):
    return a*t+c
popt, pcov = curve_fit(f, x, y)
plt.plot(x, y, '+')
plt.plot(x, f(x, *popt))
plt.show()
```


1e8
2.5
2.0
1.5
1.0
0.5
0.0
1800
1825
1850
1875
1900
1925
1950
1975
2000


1e8
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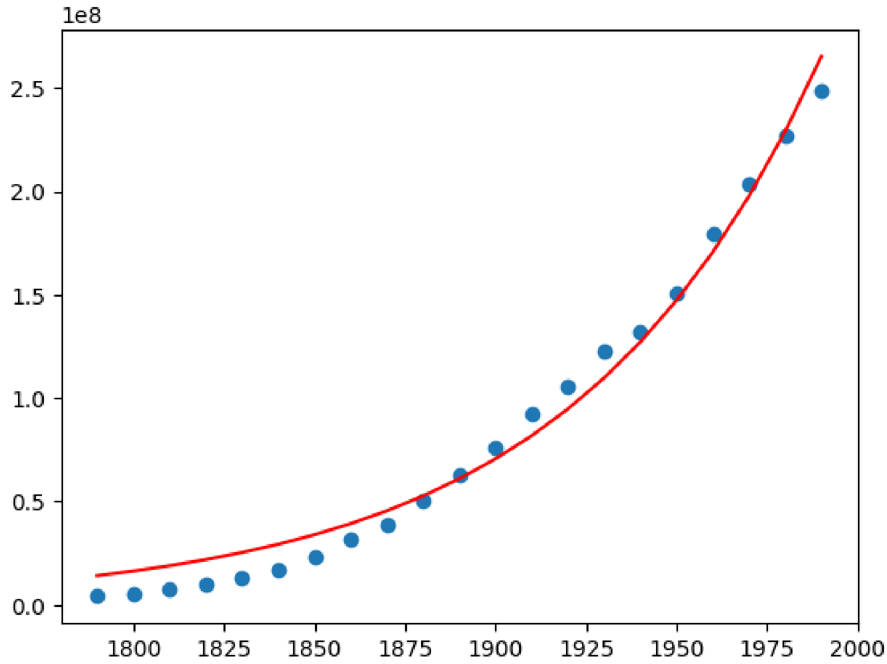
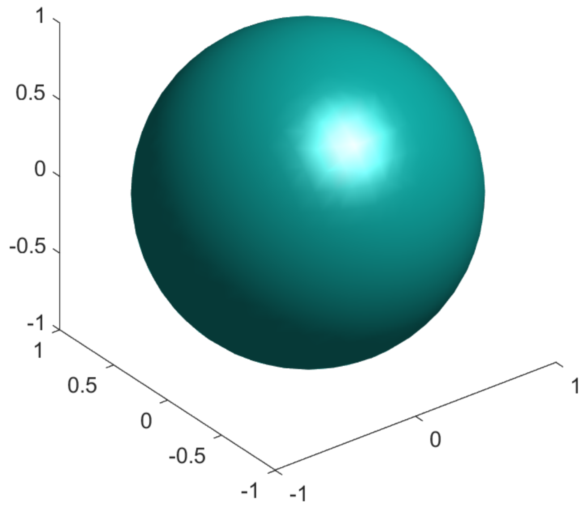


2.Matlab 作图

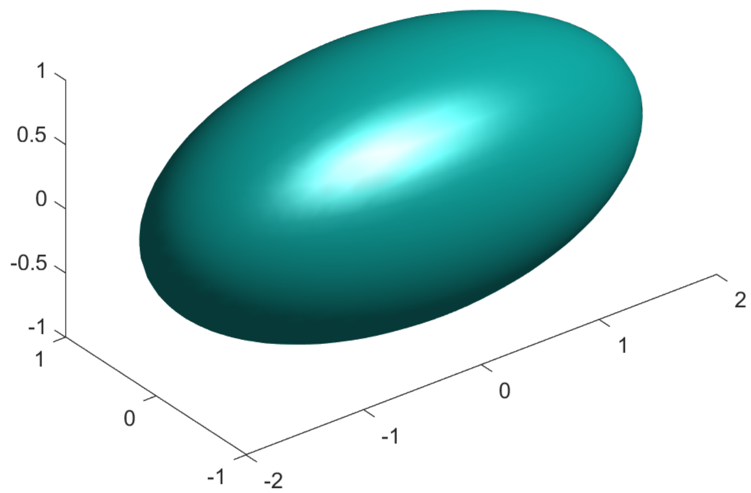
Listing 2: 2

```
[x, y, z] = meshgrid(-1:0.1:1);
isosurface(x, y, z, x.^2 + y.^2 + z.^2-1, 0);axis equal;
```



Listing 3: 3

```
[x, y, z] = meshgrid(-2:0.1:2, -2:0.1:2, -2:0.1:2);a = 2; b = 1;
isosurface(x, y, z, x.^2/a^2 + y.^2/b^2 + z.^2/b^2, 1);axis equal;
```



3.Mathematica 求不定积分

Listing 4: 3

```
Integrate[sin (x)\ [Minus]sin (3x)+sin (5x)/cos(x) + cos(3x)+ cos(5x),x]
```

Out[ ]= $4 \cos x^2 - \sin x^2 + \frac{5 \sin x^3}{3 \cos}$

4.LaTeX 或 Markdown 写出文本内容

The **Lorenz attractor** emerges in a simplified system of equations describing the two-dimensional flow of fluid. In the early 1960s, Edward Lorenz accidentally discovered the chaotic behavior of this system. For a simplified system, he found that periodic solutions of the form

$$\psi = \psi_0 \sin\left(\pi a x \frac{H}{2}\right) \sin\left(\pi \frac{z}{H}\right)$$

and

$$\theta = \theta_0 \cos\left(\pi a x \frac{H}{2}\right) \sin\left(\pi \frac{z}{H}\right)$$

grew for Rayleigh numbers larger than the critical value, R_c. This discovery marked one of the earliest observations of the so-called **butterfly effect**. Remarkably, vastly different results were obtained for very small changes in the initial values.

Lorenz formulated the simplified equations:

$$\frac{dX}{dt} = \sigma(Y - X),$$
$$\frac{dY}{dt} = X(\rho - Z) - Y,$$
$$\frac{dZ}{dt} = XY - \beta Z.$$

These equations, now known as the **Lorenz equations**, capture the chaotic behavior observed in the Lorenz attractor, playing a pivotal role in the development of chaos theory.