

例 3.8 Python 程序代码

```
from scipy.optimize import minimize
import numpy as np
import matplotlib.pyplot as plt

a0, b0 = (2., 1.)
theta = np.arange(0, 2 * np.pi, 0.01)
y0 = np.linspace(0.0, 5.0, 100)
x0 = -y0 ** 2 + 5 * y0
x1 = 5 - y0
fig = plt.figure()
axes = fig.add_subplot(111)
axes.plot(x0, y0)
axes.plot(x1, y0)
for r in range(1, 11, 3):
    x = a0 + np.sqrt(r) * np.cos(theta)
    y = b0 + np.sqrt(r) * np.sin(theta)
    axes.plot(x, y)
plt.show()

def fun(args):
    a, b = args
    v = lambda x: (x[0] - a) ** 2 + (x[1] - b) ** 2
    return v

def con(args):
    c, d, e, f = args
    cons = ({'type': 'eq', 'fun': lambda x: x[0] + x[1] + c}, \
            {'type': 'eq', 'fun': lambda x: x[0] + (x[1]) ** 2 + d * x[1]}, \
            {'type': 'ineq', 'fun': lambda x: x[0] - e}, \
            {'type': 'ineq', 'fun': lambda x: x[1] - f})
    return cons

if __name__ == "__main__":
    # 定义常量值
    args = (2, 1)
    # 设置参数范围/约束条件
    args1 = (-5, -5, 0, 0)
    cons = con(args1)
    # 设置初始猜测值
    x0 = np.asarray((0.01, 0.01))
```

```
res = minimize(fun(args), x0, method='SLSQP', constraints=cons)
print(res.fun)
print(res.success)
print(res.x)
```