```python
1  import numpy as np
2  import matplotlib.pyplot as plt
3  from scipy.integrate import odeint
4  import sys
5  import os
6
7  xmin = -1
8  ymin = -1
9  zmin = -1
10 xmax = 1
11 ymax = 1
12 zmax = 1
13
14 # Streamplot
15 # no_points = 100
16 # x_points = np.linspace(xmin, xmax, no_points)
17 # y_points = np.linspace(ymin, ymax, no_points)
18 # z_points = np.linspace(zmin, zmax, no_points)
19 # X, Y, Z = np.meshgrid(x_points, y_points)
20
21 # dxdt_streamplot = mu*X + Y - X**2
22 # dydt_streamplot = -X + mu*Y + 2*X**2
23 # dzdt_streamplot =
24
25 # Numerical integration
26 T = 500
27 t = np.linspace(0,T,T*100)
28 x = np.zeros(T)
29 y = x.copy()
30 z = x.copy()
31 # fp = np.array([[(1+(mu**2))/(2+mu), (-(2*mu-1)*(1+mu**2))/((2+mu)**2)], [0,0]])
32 # x[0] = fp[0,0] - 0.01
33 # y[0] = fp[0,1] - 0.01
34 x[0] = 0.01
35 y[0] = 0.01
36 z[0] = 0.01
37
38 def dynamical_system(xyz, t):
39     x = xyz[0]
40     y = xyz[1]
41     z = xyz[2]
42     dxdt_integration = 10*(y-x)
43     dydt_integration = 28*x-y-x*z
44     dzdt_integration =  x*y-(8/3)*z
45     return [dxdt_integration, dydt_integration, dzdt_integration]
46
47 x0y0z0 = [x[0],y[0],z[0]]
48 xyz = odeint(dynamical_system, x0y0z0, t)
49 x = xyz[:,0]
50 y = xyz[:,1]
51 z = xyz[:,2]
52
53 fig, ax = plt.subplots(subplot_kw={"projection": "3d"}, figsize=(7,7))
54 # ax.streamplot(X, Y, dxdt_streamplot, dydt_streamplot, density = 2)
55 ax.plot(x[100:], y[100:], z[100:], '-', color='red', linewidth=0.25)
56 # ax.plot(fp[0,0],fp[0,1], '.', color='black', markersize=15, label='Saddle node')
57 # ax.plot(fp[1,0],fp[1,1], '.', color='magenta', markersize=15, label='Unstable
   spiral')
58 ax.set_title('$3.1b$')
59 ax.set_xlabel('x')
60 ax.set_ylabel('y')
61 ax.set_zlabel('z')
62 # ax.set_xlim(xmin,xmax)
63 # ax.set_ylim(ymin,ymax)
64 # ax.set_ylim(zmin,zmax)
65 # ax.set_box_aspect(1)
66
67 # plt.legend(loc="upper left")
68 script_dir = os.path.dirname(__file__)
69 results_dir = os.path.join(script_dir, '3.1/')
70 plt.savefig('Dynamical systems/DS HW3/3.1/3.1b.png', bbox_inches='tight')
71 plt.show()
```