

Appendix 5: Introduction to Python Programming

Errata, 20 February 2024

The URL for the Anaconda package (first page of this appendix, p 119 in the hard cover book) has changed and one should use <https://www.anaconda.com/download>.

The simple “Hello” program statement has a case-error: the statement should use a lower case P as in

```
print( “Hello!” )
```

With the sample program for solving the logistic ordinary differential equation model (p 121 in the hard cover book), the indentations were not set correctly in the text. The lines numbered 8 – 10 in the function definition of the logistic model should be indented, showing they are part of the def block. Line 17 is a continuation of line 16 and would be indented (although this is optional). Lastly, line 33 should be indented as part of the for statement in the previous line. This program should be shown as (the line numbers are added here just for clarity, not for use in an actual program):

```
1  # Logistic growth model
2  import numpy as np
3  import matplotlib.pyplot as plt
4  from scipy.integrate import solve_ivp
5
6  # n - population size
7  def LogisticModel(t, n):
8      r = 1.1
9      k = 100
10     return r*n*(1-n/k)
11
12 n0 = 2.0
13 t0 = 0
14 tf = 10
15 steps = 10*tf
16 sol = solve_ivp(LogisticModel, [t0, tf], [n0], method='RK45',
17                 rtol=1e-6, atol=1e-9, dense_output=True)
18 t = np.linspace(t0,tf,steps+1)
19 n = sol.sol(t)
20
21 # Display data
22 #print (np.transpose([t,n[0]]))
23
24 # plot results
25 plt.plot(t, n[0])
26 plt.xlabel('Time')
27 plt.ylabel('Population size')
28 plt.savefig('Logistic.svg')
29 plt.show()
30 # Save results to a file
31 f = open('Logistic.txt', "w")
32 for i in range(0, steps+1, 1):
33     print("%5.1f, %6.2f" % (t[i], n[0][i]), file=f)
34 f.close()
```