

Scipy questions

August 2017

1. Find all the zeroes of the polynomial $x^9 - 3x^6 + x^2 + 1$.
2. Find a solution to this system of transcendental equations $xy = 2, \log x \log y = -\log 2$
3. Perform a linear least squares fit on the data set $\{(1, 2), (2, 3.5), (3, 6.5), (4, 7.8), (5, 11)\}$.
4. The following data were collected for the harmonic oscillations of a vertically suspended spring-mass system. The time measurements were

[0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0,
1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0]

and the corresponding displacements from equilibrium were

[1.78, 1.43, 1.12, 0.79, 0.30, -0.14, -0.62, -0.99, -1.30, -1.64, -1.91,
-1.97, -2.00, -1.89, -1.74, -1.44, -1.14, -0.78, -0.30, 0.12, 0.51]

The attached mass is 1. Find the spring constant k .

5. Write a program that will generate a normally distributed data sample of 100 numbers, with pdf mean $\bar{x} = 3$ and standard deviation $\sigma = 1$. Print out the mean, variance, and standard deviation of this data sample.
6. Write a program that will generate a normally distributed data sample of 10000 numbers with pdf mean 0 and standard deviation 1. Print out what percentage of these numbers falls within 1, 2 and 3 standard deviations from the mean.
7. The position of a certain particle was measured at times

[0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0]

and the measurements were

[0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55]

Write a program that writes this data to a file called data.txt. The data should be formatted into two columns, the first being labelled 'time' and the second being labelled 'position'. Then write a program that will read the data from the file, store it in an array, and produce a position-time graph for the motion.