Scipy Questions

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
$$\begin{cases} xy = 2 \\ logxlogy = log2 \end{cases}$$

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 dipslacements from equilibirum were [1.73205081, 1.4671816 , 1.12925846, 0.73510727, 0.30435362, -0.14155442, -0.58041418, -0.99037395, -1.35102101, -1.644398 , -1.85589712, -1.97498737, -1.99573903, -1.91711882, -1.74304141, -1.48217446, -1.14750705, -0.75570296, -0.3262709 , 0.11940685, 0.55913909]. At equilibrium, the spring is stretched from its relaxed length by 1. Find the spring constant *k* and the mass *m*.

5. Write a program that will generate a Poisson distributed data sample of 100 numbers with parameter $\lambda = 3$. 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 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.