Lab 1 (Python Basics)

Computing in Sciences II

January 2, 2019

Problem 1. Do the following

- Print "Hello World"
- Write a function to calculate the
  - Sum of first N natural numbers.
  - Sum of squares of first N natural numbers.
  - Verify the above by using standard formulas.
- Plot a circle with radius as 4 and centred at origin.
- Plot a parabola of your choice(say y^2=4x)

Problem 2. Write funciton which prints the Nth number in the Fibonacci series.Provide:

- Iterative Solution
- Recursive Solution

Problem 3. Trace the path of a projectile, starting at:

- Origin,with velocity of 2i+2j
- Random coordinates with random velocity (in 2- Dimensions)

Problem 4. Implement the following without using standard functions from numpy or scipy(like dot,cross,etc)

- vector dot and cross product
- matrix multiplication
- matrix determinant
- eigensystem: construct characterisitic polynomial of a matrix, and find roots (use numpy.roots). These roots will be eigenvalues. Now find eigenvector corresponding to these roots (How? substitute eigenvalue, solve the set of linear equations and get the vector).