Exercises #5

- **Problem 1.** Write a function which takes in a list of numbers and produces a list containing the average and standard deviation.

- **Problem 2.** Write a function which takes in an arbitrary Lagrangian, i.e. a function of $q$ and $q\dot{ }$, and emits the Hamiltonian.

- **Problem 3.** Write a function which takes in a Hamiltonian and an initial $p$ and $q$, and plots the corresponding trajectory in phase space.

- **Problem 4.** Extend the function to plot the evolution of a small finite region of phase space, either by evolving a cluster of randomly distributed points, or by mapping out the boundaries. (According to a theorem of classical mechanics, the area of such a region is preserved under time evolution.)