Practice Worksheet

1. Write a python code that reads (names,grades) from the file Grades1.dat. Store the names and the grades in two lists. Generate an output file where the grades are written in a descending order in the first column and the corresponding names in the second column.

2. Write a python code that generates values of the function $f(x) = exp(\frac{-x^2}{\sigma})$ for 100 values of x uniformly spaced in the domain $[-5, 5]$. Choose $\sigma = 4$ and store the function values in a list.

   (A) find the maximum f_{max} from the list containing the values of the function $f(x)$
   (B) find the value(s) of $x^\star$ for which $f(x^\star) \approx \frac{1}{2} f_{max}$.
   (C) write $\{x, f(x)\}$ in an output file and plot the function in gnuplot. Mark the $\{x^\star, f(x^\star)\}$ point(s) on the same plot.

3. Write a python code that generates values of the function $f(x) = sin(2\pi\omega x)$ for 200 values of x uniformly spaced in the domain $[-20, 20]$. Write $\{x, f(x)\}$ in an output file and plot the function in gnuplot. Choose ω such that $\{x, f(x)\}$ plot shows ~ 4 cycles .

   In gnuplot try to estimate the value of ω from fitting. Compare the numerical estimate of ω with that used in your program.

4. Write a python code to estimate reciprocal Fibonacci constant (Ψ) defined as sum of the reciprocals of the Fibonacci numbers (F_k)

$$\Psi(N) = \sum_{k=1}^{N} \frac{1}{F_k} \approx 3.359885666243... \qquad \text{for} \quad N \to \infty.$$

   (A) Determine the number of terms ($N^\star$) required to attain an accuracy in 6th place of decimal.
   (B) Plot $\{N, \Psi(N)\}$ for $N \in [1, N^\star]$ to show the convergence.

5. Try to modify/generalize the code in question 1 if there are two or more students with same grades. In that case the names with same grades need to be alphabetically sorted. You may use python built-in functions for alphabet sorting. Test your code with Grades2.dat.