Numerical Methods I

Assignment I

Due: February 13, 2019

1. Write a program to compute the following series

$$f_n(x) = \sum_{m=0}^{n} \frac{x^m}{m!}.$$

   (a) Plot $f_n(1)$ as a function of n.

   (b) Plot the error $g_n = f_n(1) - e$ as a function of n. Here $e = \exp(1) = 2.718281828....$

   (c) Find a good functional form for g_n and fit it using gnuplot. Display g_n along with the fit.

   (15 Marks)

2. Write a program to compute the first 1000 prime numbers and plot them.

   (15 Marks)

3. Consider two $N \times N$ matrices A and B with elements $A_{ij} = j + iN$ and $B_{ij} = i + jN$. Calculate the matrix product $A \times B$, the trace $\mathrm{Tr}(A)$ and $\mathrm{Tr}(B)$, and the determinant $\det(A)$ and $\det(B)$. Choose $N = 2, 50$, and 100. Write your outputs into a file.

   (15 Marks)

4. Find a two dimensional data set on the internet (sports data/meteorological data/any data of your choice) and display it in gnuplot.

   (5 Marks)