What this code is about

The Padé approximant to a given formal power series expansion $\sum_{n=0}^{\infty} a_n \beta^n$, is given by

$$P_M^N(\beta) = \frac{\sum_{n=0}^{N} A_n \beta^n}{\sum_{n=0}^{M} B_n \beta^n}, \quad B_0 = 1, \tag{1}$$

where

$$\mathbf{M} \begin{bmatrix} B_1 \\ B_2 \\ \vdots \\ B_M \end{bmatrix} = - \begin{bmatrix} a_{N+1} \\ a_{N+2} \\ \vdots \\ a_{N+M} \end{bmatrix}, \tag{2}$$

With $\mathbf{M}_{i,j} = a_{N+i-j}(1 \leq i, j \leq M)$. The coefficients in the numerator are

$$A_n = \sum_{j=0}^{n} a_{n-j} B_j, \quad 0 \leq n \leq N. \tag{3}$$

The C++ code constant.cpp solves the system (2) for the coefficients B_j and writes to the file Constant.txt. The matrix $\mathbf{M}$ and the vector at the right-hand side of (2) are populated by the coefficients a_n's which are read-in from the file moments.txt. We apply the Pade approximant to the energy correction of the ground-state energy of the funel potential,

$$E(\beta) = 1 + \sum_{k=1}^{\infty} e^{(k)} \beta^k = 1 + \beta \sum_{k=0}^{\infty} e^{(k+1)} \beta^k \tag{4}$$

The file const.sh is a shell script used to compile and run the code in an Ubuntu 22.04 local machine.