Evaluation test Numerical Method I
Course for CMPSP/ESP students

October 7, 2022

The file **temperature_2010_Trieste.dat** contains the ECMWF Reanalysis average daily temperature for the model grid point nearest to the Trieste city coordinates. The file contains two columns: day of the year and temperature in degree Celsius. Assume that the year temperature cycle can be well approximated by the function:

$$T(x) = 10sin((\pi((x - 109.5)/183))) + 12.2 \quad (1)$$

where x is the day of the year expressed as real value with 1 in January, 1^{st}, and 365 in December, 31^{st}.
Write a computer program using the Fortran programming language which:

1. Reads the data from the file in two Fortran arrays, day and temperature
2. Compute the maximum value, minimum value and average avg of the temperature and prints them on screen.
3. Using the temperature values from equation 1 and the computed average avg, find the day index x_i in which the temperature in Trieste goes:
   - from below the average to above the average in April
   - from above the average to below the average in October

Hints:

1. April first is day (31+28+31)+1 = 91
2. Use a numerical method to find the root in an interval and assume half a day as the precision.
3. Remember that you can compute $\pi = 4 \arctan(1.0)$
4. You can transform the equation $T(x) = avg$ into $T(x) - avg = 0$

- E-mail program source codes to: ggiulian@ictp.it