# Problem n.4

The file `power.txt` reports the measurements of the electric power consumption in one household collected every day for one year. Considering a functional data analysis approach, answer to the following questions.

a) Perform a smoothing of the data using a Fourier basis. Choose the number of basis functions using a generalized cross-validation (GCV) criterion. Report the plot of the values of the GCV statistic as a function of the number of basis functions, the number of basis functions chosen, a plot of the basis system used and a plot of the smoothed data.

b) Compute an approximation of the first derivative of the curve from the data and the first derivative of the smoothed curve obtained at point (a). Provide a plot to compare the two and comment on the result.

c) Choose a number of basis functions that you deem appropriate to show the effect of oversmoothing. Report the number of basis functions chosen, provide a plot of the the smoothed data and comment the result.

d) Choose a number of basis functions that you deem appropriate to show the effect of overfitting. Report the number of basis functions chosen, provide a plot of the the smoothed data and comment the result.

Upload your results here:
https://forms.office.com/Pages/ResponsePage.aspx?id=K3EXCvNtXUKAjjCd8ope612LHtvIHvFEsEi2L6mhPg
lURENHUDcyOUFUTVlSUUVKMUU4RUo2NO9GVS4u