Exercise 9

General instructions: Follow these instructions, as they facilitate the revision of the exercises. The review takes into account that you always use the requested file names. Send only the files requested in the exercise. Return your answers to your assistant as an e–mail entitled TilaI,2017. If you have not programmed before, choose only one of the programming languages (**octave**/**python**), and do not change it during the course. If you are sure that you want to try both languages, you can of course do the exercises of both languages. However return the exercises to your assistant in one language only.

- **Exercise 9a:** The instructions apply for both **python** and **octave**.

  There are two images on the course homepage. The image `H9aPmalli.jpg` is made with **python**. The image `H9aOmalli.jpg` is made with **octave**. In both images is the Rayleigh test periodogram $z(f_\mathrm{j})$ in the LaTeX document `H8bmalli.pdf` of the previous Exercise 8b. The periodogram $z(f_\mathrm{j})$ is computed for the time points t_i in the first column of the file `H7binput.dat`. E.g. the value of the first time point is $t_1 = 1.080$. The tested period range is $P_\mathrm{min} = 1.5$ and $P_\mathrm{max} = 90$. The periodogram is computed with the formula

$$z(f_\mathrm{j}) = \{[\sum_{\mathrm{i}=1}^{\mathrm{n}} \cos 2\pi f_\mathrm{j}(t_i - t_0)]^2 + [\sum_{\mathrm{i}=1}^{\mathrm{n}} \sin 2\pi f_\mathrm{j}(t_i - t_0)]^2\}/n,$$

  where f_j is the tested frequency and the zero-point of time $t_0 = 0$. In the images `H9aPmalli.jpg` and `H9aOmalli.jpg` is marked into the periodogram with a red circle the highest peak related to the best period. In addition the number of time points $n = 528$ is given as text, and also the value of the best period $P = 2.85$.

  Write a **python** program `H9avalmis.py`, that produces the image `H9aPvalmis.jpg`. The **content** of the image `H9aPvalmis.jpg` has to match as accurately as possible the image `H9aPmalli.jpg` on the course homepage.

  or

  Write an **octave** program `H9avalmis.m`, that produces the image `H9aOvalmis.jpg`. The **content** of the image `H9aOvalmis.jpg` has to match as accurately as possible the image `H9aOmalli.jpg` on the course homepage.

  Hint: In the programs of Lecture 6 `Psub2.py` and `Osub2.m` is computed $z(f_j)$ for one frequency value.

  Requirements of Exercise 9a
  The command `python H9avalmis.py` produces the image `H9aPvalmis.jpg`, whose **content** matches as accurately as possible the image `H9aPmalli.jpg` on the course homepage.

  or

  The command `octave H9avalmis.m` produces the image `H9aOvalmis.jpg`, whose **content** matches as accurately as possible the image `H9aOmalli.jpg` on the course homepage.

- **Exercise 9b** On the course homepage is the LaTeX model file `H9bmalli.pdf`. Write a new LaTeX file `H9bvalmis.tex.` The command `pdflatex H9bvalmis` should produce the file `H9bvalmis.pdf`, whose **content** matches as accurately as possible the model file `H9bmalli.pdf`. **The format** does not have to be exact: e.g. the colour of the text can be black throughout the document. Also the placement of the images and tables can differ.

  First copy from the course homepage the files `H7amodel.dat`, `H10aPmalli.jpg` and `H10bPmalli.jpg` into the same directory, where you write your new LaTeX file `H9bvalmis.tex`.

  Start the file `H9bvalmis.tex.` with the lines

```
% ____________________________________________________________
\documentclass{article}
\usepackage[dvips]{graphicx}
\usepackage{color}
\usepackage[finnish]{babel}
\usepackage[utf8]{inputenc}
\newcommand{\LAT}{{\color{red} \bf \LaTeX}}
\newcommand{\PYT}{{\color{red} \bf python}}
\newcommand{\OCT}{{\color{red} \bf octave}}
\pagestyle{empty}
\hoffset=-4.0cm
\textwidth=20.0cm
\voffset=-3.5cm
\textheight=26.0cm
\begin{document}
\normalsize
\twocolumn

\begin{center}
{\bf Tehospektri}
\end{center}
```

Turning in the exercises

Send to the course assistant an e–mail with the following attachments:
H9a: `H9avalmis.py` & `H9aPvalmis.jpg` or `H9avalmis.m` & `H9aOvalmis.jpg`
H9b: `H9bvalmis.tex` and `H9bvalmis.pdf`