

## Sheet 4 – Functions and basic plotting

Please write all commands in the MATLAB editor into separate m-files and save it in a folder that you specifically dedicate to this workshop. If you don't know how a command is being used type "help [commandname]" into the command window. Comment each code line briefly to document what it is doing.

### Exercise 1:

Write a function called `my_norm_p`. This function should accept as input a (row or column) vector `x` and as a second argument the order `p` according to the p-norm. The function should output the p-norm calculated from the vector `x` according to the following equation:

$$||x||_p = \sqrt[p]{\sum_{i=1}^n |x|_i^p}$$

Hereby, `n` is the number of elements of the vector `x`. When finished with the function, write a script generating a 1000-element normally distributed vector and calling your function `my_norm_p` to calculate the 1-norm, 2-norm, 3-norm, and 4 norm from this vector.

### Exercise 2:

MATLAB contains pre-installed audio-data that can be loaded into the workspace.

- Type `load handel.mat` to receive a mono audio signal `y` and its sampling frequency `Fs`.
- Plot the signal `y` with a correct time axis as abscissa.
- Attenuate the signal `y` by a factor of 8 and plot the result on top of the original signal using a different color.
- Add title, labels, a grid, and add a legend that explains what each curve means. The legend should not cover any part of any curve. Use commands in the m-file to do this.
- Listen to the signal with `sound`.

## Exercise 3 (optional):

- a) Show that  $y = e^{-x}$  will show up as a straight line in a semilogarithmic plot. In that, mark the single data points with a symbol of your choice.
- b) Find an example for a function that only shows up as a straight line in a double-logarithmic plot and prove it with MATLAB. What does the slope of that function in a double-logarithmic plot tell?