

Tutorial 2

In this tutorial we will develop some intuition about the linear (or vector space) structure of function spaces. We will also use the tutorial to obtain some experience with python and NumPy.

Polynomials:

- 1.) Construct five different, random polynomials of degree three and five, respectively. The polynomials should be, in an appropriate sense, normally distributed.
- 2.) Evaluate the polynomials at equi-spaced points in $[-1, 1]$. What is both an efficient and robust way to perform the evaluation?
- 3.) Generate plots of the polynomials of degree three and five, respectively.
- 4.) Construct the polynomials of degree three and five that are the linear combinations of the randomly generated ones. Plot these together with the random polynomials.

Harmonic polynomials:

- 1.) Construct five different, random functions in the spaces \mathcal{F}^3 and \mathcal{F}^5 that were introduced in the last lecture. The harmonic polynomials should be, in an appropriate sense, normally distributed.
- 2.) Evaluate the functions in \mathcal{F}^3 and \mathcal{F}^5 at equi-spaced points in $[0, 2\pi]$. How could you perform the evaluation without library functions “sin” and “cos”?
- 3.) Generate plots of the functions in \mathcal{F}^3 and \mathcal{F}^5 , respectively.