TMA4170 Fourier Analysis 2025

Lecturer: Espen R. Jakobsen

Text book: Stein & Shakarchi: *Fourier Analysis, an introduction.*

Exercises: Non-mandatory, but essential for learning

Student exercise groups to help out:

- Make sol'ns to some problems (only sol'ns you will get)
- Help out in some exercise classes (with lecturer)
- More info and sign up will follow

Ref. Group: Appointed next week

Exam: Wrtitten school exam, 4 hours, 100% of grade

ALL INFO: https://wiki.math.ntnu.no/tma4170/2025v/

About the course

- Fourier series and transforms, DFT, FFT
- Mathematical analysis:
  - Summability, convergence (difficult!): pt.w., uniform, L^2
  - Properties, decay vs regularity
- Applications include:
  - Weierstrass approximation theorem
  - Weil equidistribution theorem
  - Poisson summation formula
  - Heisenberg uncertanty principle
  - Solution of PDEs

Some Motivation

- Central part of recent and modern mathematics
- Important tool in analysis, PDEs, probability theory, number theory, dynamical systems...
- PDEs/physical sciences
  - **Mathematics 4K:** Separation of variables + Fourier series, Fourier transform methods
  - Modern analysis of PDEs
- Signal analysis (radio, wifi etc)
  - Filtering, denoising, compression, coding-decoding
- Numerics and matrix computations by DFT/FFT