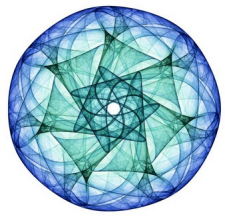

# Midterm Exam Outline

Math 124B: Numerical Analysis
Professor: Paul J. Atzberger

- Fourier Series
  - real-valued sine/cosine expansion
    - coefficients from function integrations
    - series representations
  - complex-valued exponential expansion
    - coefficients from function integrations
    - series representations
  - conversion between
    - real-valued $A_n$,$B_n$ coefficients
    - complex-valued coefficients $c_n$

- Analysis
  - definitions of convergence
    - uniform convergence
    - pointwise convergence
    - $L^2$-convergence
    - weak convergence

- Fourier Methods
  - theorems for convergence (conditions)
    - uniform convergence
    - pointwise convergence
    - $L^2$-convergence
  - ability to compute fourier series representations of
    - continuous functions
    - discontinuous functions
    - $L^2$-functions

- Solution of Parabolic PDEs
  - Fourier series approaches in cases
    - periodic boundary conditions.
    - homogeneous dirichlet boundary conditions.
    - homogeneous neumann boundary conditions.
    - inhomogeneous dirichlet boundary conditions, h(t), j(t).

- Solution of Hyperbolic PDEs
  - Fourier series approaches in cases
    - periodic boundary conditions.
    - homogeneous dirichlet boundary conditions.

- Solution of Elliptic PDEs (2D/3D)
  - maximum principle
  - existence and uniqueness
  - Fourier series approaches in cases
    - rectangle: dirichlet boundary conditions (homogeneous).
    - rectangle: neumann boundary conditions (homogeneous).
    - cube: dirichlet boundary conditions (homogeneous).
    - cube: neumann boundary conditions (homogeneous).