Math 454/554 Review

1 Theory

- Know what $C([a, b])$ means.
- Definitions of $\|\cdot\|_\infty$ and $\|\cdot\|_2$ on $C([a, b])$; uniform and mean convergence
- The definition of $\langle \cdot, \cdot \rangle$ on $C([a, b])$.
- orthonormality, orthogonality: how to prove a collection of functions exhibits this property
- Bessel's inequality: know the statement and the proof!
- complete orthonormal systems; examples of complete orthonormal systems on $[0, c]$ and $[-c, c]$
- Parseval's formula
- definition of a linear map between vector spaces; definition of a norm on a vector space

2 Practice

- how to calculate the Fourier coefficients of a given continuous function on $[-c, c]$ or the sine/cosine coefficients on $[0, c]$
- how to calculate the Fourier series of a given continuous function on $[-c, c]$ or the Fourier cosine and sine series on $[0, c]$.
- the heat equation in 1 temporal and 1,2, or 3 spatial variables (no internal heat source, other conditions)
- how to interpret boundary conditions (insulation, constant temperature, steady-state, etc)
- the definition of the Laplacian
- method of separation of variables and where it applies

- use of Fourier series to solve the heat equation; constraints given by boundary conditions
- Laplacian in cylindrical coordinates; heat equation and boundary conditions in cylindrical coordinates
- Cauchy-Euler technique

3 Theory/Practice

- For a continuous function on $[-c, c]$ ($[0, c]$), convergence of the Fourier (Cosine, Sine) series to f in MEAN