

## FOURIER ANALYSIS & METHODS GOALS FOR 2020.01.20

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Each lecture we have a shared goal: that *you* will be able to wield a certain set of math tools. We are building up your mathematical toolbox, equipping you with some of the most powerful mathematical tools which are used to solve the most important partial differential equations in physics and chemistry. For our theoretically minded friends, you are also learning deep theory which lies at the intersection of functional analysis and PDEs, but goes even deeper and connects to areas like representation theory, analytic number theory, and (Julie's favorite) geometric analysis. So, whether you are pragmatically minded and just want to make sure you've solved the heat equation correctly so your lab won't explode, or whether you are theoretically minded and love proving theorems, there is something for you here!

### 1. LEARNING OBJECTIVES

Our goals for today are that:

- (1) You will be able to recognize the difference between an ordinary differential equation (ODE) and a partial differential equation (PDE).
- (2) You will be able to plug a given function into a PDE and compute this correctly. This is similar to two of the do-it-yourself exercises 1.1.1 and 1.2.5a.
- (3) You will be able to turn a PDE into one or more ODEs using Technique 0, also known as separating variables. This is similar to the to-be-demonstrated exercise 1.3.1.
- (4) You will be able to find solutions to those PDEs which are separable, meaning they can be turned into ODEs using separation of variables. This is similar to do-it-yourself exercise 1.3.7.

Ready, set, let's go!