

Math 344: Homework 7

Complete by Friday, November 9

- Orthogonality and Length for Functions.** Let $g(x) = e^{2\pi ix}$ and $h(x) = 2i \sin(6\pi x)$. Assume the domain for both functions is $[0, 1]$.
 - Determine whether or not the functions g and h are orthogonal, using the inner product we defined in class. (Consider converting h into exponential functions.)
 - Compute the lengths of g and h , using the notion of length we defined in class.
- Plugging Fourier series into PDEs.** Suppose $u(x, t)$ is a function that is periodic in t with period 1 and satisfies the differential equation $u_{tt}(x, t) + u_{xx}(x, t) = 0$. Write down (but do not solve) a differential equation satisfied by the Fourier coefficients for $u(x, t)$.
- Solving PDEs using Fourier series.** Suppose $u(x, t)$ is a function that is periodic in x with period 1 and satisfies the differential equation $u_t(x, t) = u_x(x, t)$. Determine the Fourier series representation of $u(x, t)$.