Document Title

Joel Sleeba
University of Houston
joelsleeba1@gmail.com

November 17, 2024

Contents

Chapter 1

Fourier Series on the Circle

1.1 Motivation and Heuristics

1.1.1 Motivations from Physics

The Vibrating String

Exercise 1.1.1. *Use Induction. Show that* $\sin^3(x)$ *can be written as a sum of three sines.*

Exercise 1.1.2. *Use contradiction. Integrate over* $[0, \pi]$.

Exercise 1.1.3. *Use the same logic as above.*

Exercise 1.1.4. *Easy*

The Heat Flow in Solids

1.1.2 Absolutely Convergent Trigonometric Series

Exercise 1.1.7. *Use triangle inequality on the definition of limit. Then use the given hint and the absolute convergence of the sequence again. Now use dominated convergence theorem for the counting measure.*

Exercise 1.1.8. *Same method as above the exercise using induction.*

Corollary 1.1.9. *Why is*

$$\int_{\mathbb{T}} g(\phi - \theta) e^{-in\theta} \, d\theta = \int_{\mathbb{T}} g(y) e^{in(y-\phi)} \, dy$$

Shouldn't that be the negative of the RHS.