

Fourier Analysis Exercises 1

1. Prove that

$$\int_{-L}^L \sin \frac{n\pi x}{L} dx = 0$$

for any integer n .

2. Prove that

$$\int_{-L}^L \sin \frac{n\pi x}{L} \sin \frac{m\pi x}{L} dx = L\delta_{m,n}$$

for all integer values of m and n .

3. Using the above results prove that

$$b_n = \frac{1}{L} \int_{-L}^L f(x) \sin \frac{n\pi x}{L} dx$$

where b_n is the Fourier coefficient as defined in the lecture notes.