

Homework 4 - Due Wed. Apr. 11th
Introduction to Harmonic Analysis and its Applications

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Homework Policies

As in Homework 1.

Assignment

Exercises

Exercise 1 (50pts). Exercise 5.2 in S. Mallat's book. Prove that for any $\lambda \in \mathbb{R} \setminus \{0\}$ the system $\{e^{2\pi k i n \cdot / \lambda}\}_{k \in \mathbb{Z}}$ is a tight frame of $L^2([0, 1])$, and compute the frame bound. [Hint: do not forget to show completeness].

Exercise 2 (50pts). Consider d vectors v_1, \dots, v_d spanning a subspace \mathbf{V} in $L^2(\mathbb{R})$ (or $L^2(S^1)$, or $L^2([0, 1])$ if you prefer). First show that v_1, \dots, v_d is a frame for \mathbf{V} . Then construct an example of a system $\{v_1, \dots, v_d\}$, for each d , where as $d \rightarrow +\infty$, the frame bounds $A, B > 0$ tend to 0 and $+\infty$ respectively.