

Homework 5:

Problem 5.1: (Muscalu, Schlag, *Classical and Multilinear Harmonic Analysis*, Vol 1, Section 8.2, Corollary 8.4 (i), P.202-203)

In their proof of Corollary 8.4 (i), they write

$$S(f_k - f)(x) \leq \liminf_{m \rightarrow \infty} S(f_k - f_m)(x).$$

Please provide a proof of this inequality.

Problem 5.2: (Khinchin's inequality) In its proof, one can first prove the following version with real coefficients  $a_n$ ,

$$E \left( \left| \sum_{n=1}^N a_n w_n \right|^p \right)^{1/p} \asymp \left( \sum_{n=1}^N |a_n|^2 \right)^{1/2}$$

for  $1 < p < \infty$ . Assuming the above inequality, one can then extend it to a version with complex coefficients  $a_n$ . Please explain how to extend it to complex coefficients.