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Weighted Ergodic Averages

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Abstract: Let (X, {\cal F}, ●) be the unit circle \Bbb S^1 = \{z \in \Bbb C : |z| = 1\} with the usual σ-algebra {\cal F} of Lebesgue measurable subsets and the normalized Lebesgue measure ●. Consider a sequence $■_n$: \Bbb N \ra \Bbb R, \;\; $■_n(k) \geq 0$, \;\; $\Sigma^{\infty}_{k=1} ■_n(k) = 1$. For any measure-preserving τ : X \ra X, this sequence induces a sequence $(T_n)^{\infty}_1$ of bounded, linear operators on $L^p(X)$, \;\; 1 \leq p \leq \infty, by defining \[$T_n f = \sum^{\infty}_{k=1} ■_n(k) \; f \circ \tau^k$, \quad n = 1, 2, \ldots . \] We shall prove that under suitable conditions imposed on τ and $(■_n)^{\infty}_1$, there exists a large collection of measurable characteristic functions f for which $\lim \sup_{n \ra \infty} T_n f - \lim \inf_{n \ra \infty} T_n f = 1$ a.e on X.

Key Words: Weights, weighted averages, Fourier transforms.

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