

Let $\{X_j\}_{j=1}^{\infty}$ be a sequence of random variables satisfying

$$E[X_j] = 0, E[|X_i \cdot X_j|] \leq 2^{-|i-j|}, E[X_j^2] = 1$$

Prove that

$$\text{plim}_{n \rightarrow \infty} \frac{1}{n} \sum_{j=1}^n X_j = 0.$$