Abstract

This thesis is divided into two parts. The first part focuses on mappings in $\mathbb{R}^n$ and the weak limits of homeomorphisms in the Sobolev space $W^{1,p}$. Our primary concern is the concept of "injectivity almost everywhere". We demonstrate that when $p \leq n-1$, the weak limit of homeomorphisms can fail to satisfy this condition. Conversely, when $p > n-1$, the weak limit is "injective almost everywhere".

In the second part, we investigate the Hardy spaces in the complex plane. It is established that for a simply connected domain $\Omega \subsetneq \mathbb{C}$, there exists a constant H_Ω such that any conformal mapping from the unit disk in $\mathbb{C}$ onto Ω belongs to the Hardy space H^p for all $p < H_\Omega$. Conversely, for $q > H_\Omega$, no such mapping exists in the space H^q. However, we demonstrate that by allowing quasiconformal mappings instead of conformal ones, a quasiconformal mapping can be found from the unit disk onto Ω that belongs to the Hardy space H^p for every $0 < p < \infty$.