NONSTANDARD PROOF OF THE DUNFORD-PETTIS-THEOREM

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Topic #4: *Nonstandard Methods in Functional Analysis.*

In the 1980s Leif Arkeryd published a series of papers using nonstandard methods in kinetic theory. In particular he shows that the Boltzmann Equation has a time-global solution for arbitrary initial data. This problem was unsolved since 1872. Arkeryd used Loeb-Integration, so his solutions are functions defined on ${}^*\mathbb{R}^d$. Therefore the mathematical community hesitated to accept this result. In 1989 DiPerna and Lions proved the "same" result in a celebrated paper by standard methods. In an essential step they used a Dunford-Pettis criterion. We show that the conditions of this criterion are very close to the concept of S-Integrability, which is a main tool in Arkeryd's work.

Moreover we give nonstandard proofs of two versions of the Dunford-Pettis theorem.

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