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SPACEABILITY OF SETS IN $L^p \times L^q$ AND $C_0 \times C_0$

A subset E of an infinitely dimensional linearly–topological space X is called spaceable if there is an infinitely dimensional closed subspace Y of X with $Y \subset E \cup \{0\}$. During the talk I will show the spaceability of the following sets:

1. the set of those $(f, g) \in L^p \times L^q$ for which $fg \notin L^r$ provided that one of the following conditions holds:
   (a) $0 < \frac{1}{p} + \frac{1}{q} < \frac{1}{r}$ and $\sup\{\mu(A) : \mu(A) < \infty\} = \infty$;
   (b) $\frac{1}{p} + \frac{1}{q} > \frac{1}{r}$ and $\inf\{\mu(A) : \mu(A) > 0\} = 0$;
2. the set of those $(f, g) \in C_0 \times C_0$ for which fg is not integrable, where C_0 is the space of continuous mappings which vanish at infinity;
3. the set of those $(f, g) \in L^p(G) \times L^q(G)$ for which the convolution $f \star g$ is not well-defined or is equal to ∞ provided G is a locally compact non-compact topological group and $p, q > 1$ with $1/p + 1/q < 1$.

The results are continuation of our previous research in which we studied these sets from the Baire category and σ-porosity points of view.

References

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