

Hypercyclic operators on countably dimensional spaces

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According to Grivaux, the group \$GL(X)\$ of invertible linear operators on a separable infinite dimensional Banach space \$X\$ acts transitively on the set \$\Sigma(X)\$ of countable dense linearly independent subsets of \$X\$. As a consequence, each \$A\in \Sigma(X)\$ is an orbit of a hypercyclic operator on \$X\$. Furthermore, every countably dimensional normed space supports a hypercyclic operator.

We show that for a separable infinite dimensional Fr\'echet space \$X\$, \$GL(X)\$ acts transitively on \$\Sigma(X)\$ if and only if \$X\$ possesses a continuous norm. We also prove that every countably dimensional metrizable locally convex space supports a hypercyclic operator.

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