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## A Nonsmooth Continuous Unitary Representation of a Banach-Lie Group

We show that the representation of the additive group of the Hilbert space  $L^2([0,1],\mathbb{R})$  on  $L^2([0,1],\mathbb{C})$  given by the multiplication operators  $\pi(f) := e^{if}$  is continuous but its space of smooth vectors is trivial. This example shows that a continuous unitary representation of an infinite dimensional Lie group need not be smooth.

**Keywords**: Infinite-dimensional Lie group, unitary representation, smooth vector.

MSC: 22E65, 22E45