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Hyperbolic geometry via functional equations

Let X be a real inner product space of (finite or infinite) dimension at least 2. With implicit notions

(i) of translations t (of X along a fixed axis), and

(ii) of distances d satisfying essentially the functional equations of translation, invariance and additivity,

exactly two geometries with translations t and distances d are characterized up to isomorphism, namely euclidean and Bolyai–Lobachevski geometry over X of dimension $\dim X$.

The methods of the longer proof depend heavily on the theory of functional equations, especially on results of J. Aczél and Z. Daróczy. Our theory in question is part of a book "Geometry of real inner product spaces", forthcoming.