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Journal of Convex Analysis 24 (2017) 795–805

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Ellipsoidal Cones in Normed Vector Spaces

The characterization of ellipsoids is intimately tied to characterizing the Banach spaces that are Hilbert spaces. We give two characterizations of cones over ellipsoids in real normed vector spaces. Let C be a closed convex cone with nonempty interior such that C has a bounded section of codimension 1. We show that C is a cone over an ellipsoid if and only if every bounded section of C has a center of symmetry. We also show that C is a cone over an ellipsoid if and only if the affine span of $\partial C \cap \partial(a - C)$ has codimension 1 for every point a in the interior of C . These results generalize the finite-dimensional cases proved by J. Jerónimo-Castro and T. B. McAllister [*Two characterizations of ellipsoidal cones*, J. Convex Analysis 20 (2013) 1181–1187].

Keywords: Ellipsoidal cone, ordered normed linear space, centrally symmetric convex body.

MSC: 46B20; 52A50, 46B40, 46B10