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ON THE CLASS OF BANACH SPACES WITH JAMES CONSTANT $\sqrt{2}$, III

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Abstract. We present a new characterization of two-dimensional Banach spaces with James constant $\sqrt{2}$. As an application, we give an example of a two-dimensional Banach space with James constant $\sqrt{2}$ that is not isometrically isomorphic to any absolute, or symmetric, or $\pi/2$-rotation invariant normed space. It is shown that this gives a counterexample to Lassak's conjecture.

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REFERENCES

[1] J. ALONSO, *Uniqueness properties of isosceles orthogonality in normed linear spaces*, Ann. Sci. Math. Québec **18** (1994), 25–38.
[2] J. ALONSO, H. MARTINI AND S. WU, *On Birkhoff orthogonality and isosceles orthogonality in normed linear spaces*, Aequationes Math. **83** (2012), 153–189.
[3] G. BIRKHOFF, *Orthogonality in linear metric spaces*, Duke Math. J., **1** (1935), 169–172.
[4] F. F. BONSALL AND J. DUNCAN, *Numerical ranges II*, Cambridge University Press, Cambridge, 1973.
[5] J. GAO AND K.-S. LAU, *On the geometry of spheres in normed linear spaces*, J. Aust. Math. Soc. Ser. A **48** (1990), 101–112.
[6] H. HADWIGER, *Ungelöste probleme, no. 20*, Elem. Math. **12** (1957), 121.
[7] C. HE, H. MARTINI AND S. WU, *On covering functionals of convex bodies*, J. Math. Anal. Appl. **437** (2016), 1236–1256.
[8] D. JI, J. LI AND S. WU, *On the uniqueness of isosceles orthogonality in normed linear spaces*, Results Math. **59** (2011), 157–162.
[9] N. KOMURO, K.-S. SAITO AND R. TANAKA, *On the class of Banach spaces with James constant $\sqrt{2}$*, Math. Nachr. **289** (2016), 1005–1020.
[10] N. KOMURO, K.-S. SAITO AND R. TANAKA, *On the class of Banach spaces with James constant $\sqrt{2}$, II*, Mediterr. J. Math. **13** (2016), 4039–4061.
[11] M. LASSAK, *Covering a plane convex body by four homothetical copies with the smallest positive ratio*, Geom. Dedicata **21** (1986), 157–167.
[12] B. D. ROBERTS, *On the geometry of abstract vector spaces*, Tohoku Math. J. **39** (1934), 42–59.

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