

SHARP MEAN TRIANGLE INEQUALITY

MASATOSHI FUJII, MIKIO KATO, KICHI-SUKE SAITO
AND TAKAYUKI TAMURA

Abstract. By using a mean operator we shall present some sharp mean triangle inequalities in a Banach space which generalize the sharp triangle inequality with n elements and its reverse one shown recently by the last three authors in [7]. In the course of doing this we shall present a new two element triangle inequality with parameter and its reverse. Several applications will be given.

Mathematics subject classification (2010): 46B20, 46B25.

Keywords and phrases: triangle inequality, mean.

REFERENCES

- [1] J. B. DIAZ AND F. T. METCALF, *A complementary triangle inequality in Hilbert and Banach spaces*, Proc. Amer. Math. Soc., **17** (1966), 88–97.
- [2] S. S. DRAGOMIR, *Reverses of the triangle inequality in Banach spaces*, J. Inequal. Pure and Appl. Math., **6**, 5 (2005), Art. 129, pp. 46.
- [3] S. S. DRAGOMIR, *Generalizations of the Pečarić-Rajić inequality in normed linear spaces*, Math. Inequal. Appl., **12** (2009), 53–65.
- [4] C. F. DUNKL AND K. S. WILLIAMS, *A simple norm inequality*, Amer. Math. Monthly, **71** (1964), 53–54.
- [5] C.-Y. HSU, S.-Y. SHAW AND H.-J. WONG, *Refinements of generalized triangle inequalities*, J. Math. Anal. Appl., **344** (2008), 17–31.
- [6] H. HUDZIK AND T. R. LANDES, *Characteristic of convexity of Köthe function spaces*, Math. Ann., **294** (1992), 117–124.
- [7] M. KATO, K.-S. SAITO AND T. TAMURA, *Sharp triangle inequality and its reverse in Banach spaces*, Math. Inequal. Appl., **10** (2007), 451–460.
- [8] L. MALIGRANDA, *Simple norm inequalities*, Amer. Math. Monthly, **113** (2006), 256–260.
- [9] K.-I. MITANI, K.-S. SAITO, M. KATO AND T. TAMURA, *On sharp triangle inequalities in Banach spaces*, J. Math. Anal. Appl., **336** (2007), 1178–1186.
- [10] J. L. MASSERA AND J. J. SCHÄFFER, *Linear differential equations and functional analysis I*, Ann. of Math., **67** (1958), 517–573.
- [11] J. PEČARIĆ AND R. RAJIĆ, *The Dunkl-Williams inequality with n elements in normed linear spaces*, Math. Inequal. Appl., **10** (2007), 461–470.
- [12] S. SAITO, *Generalizations of the triangle inequality*, J. Inequal. Pure Appl. Math., **4**, 3 (2003), Art. 62, pp. 5.
- [13] W. TAKAHASHI, *Nonlinear Functional Analysis*, Yokohama Publishers, Yokohama, 2000.