

CHARACTERIZATIONS OF CONVEXITY VIA HADAMARD'S INEQUALITY

MIHÁLY BESENYEI AND ZSOLT PÁLES

Abstract. The classical Hermite–Hadamard inequality, under some weak regularity conditions, characterizes convexity. The aim of the present paper is to give analogous result for the case of generalized convexity induced by two dimensional Chebyshev systems. The basic tool of the proofs is a characterization theorem of continuous, non-convex functions.

Mathematics subject classification (2000): 26A51, 26B25, 26D15.

Key words and phrases: Hermite–Hadamard inequality, higher-order generalized convexity, Chebyshev system.

REFERENCES

- [1] E. F. BECKENBACH, *Generalized convex functions*, Bull. Amer. Math. Soc. **43**, (1937), 363–371.
- [2] M. BESENYEI, *Hermite–Hadamard-type inequalities for generalized 3-convex functions*, Publ. Math. Debrecen **65**, 1-2 (2004), 223–232.
- [3] M. BESENYEI, Zs. PÁLES, *Higher-order generalizations of Hadamard's inequality*, Publ. Math. Debrecen **61**, 3-4 (2002), 623–643.
- [4] M. BESENYEI, Zs. PÁLES, *Hadamard-type inequalities for generalized convex functions*, Math. Inequal. Appl. **6**, 3 (2003), 379–392.
- [5] M. BESENYEI, Zs. PÁLES, *On generalized higher-order convexity and Hermite–Hadamard-type inequalities*, Acta Sci. Math. (Szeged) **70**, (2004), 13–24.
- [6] M. BESENYEI, Zs. PÁLES, *Hermite–Hadamard inequalities for generalized convex functions*, Aequationes Math. **69**, (2005), 32–40.
- [7] M. K. BAKULA, J. PEĆARIĆ, *Note on some inequalities for generalized convex functions*, Math. Inequal. Appl., **9**, 1 (2006), 43–52.
- [8] P. CZINDER, Zs. PÁLES, *An extension of the Hermite–Hadamard inequality and an application for Gini and Stolarsky means*, J. Inequal. Pure Appl. Math. **5**, 2 (2004), Article 42, pp. 8 (electronic).
- [9] J. HADAMARD, *Étude sur les propriétés des fonctions entières et en particulier d'une fonction considérée par Riemann*, J. Math. Pures Appl. **58**, (1893), 171–215.
- [10] S. KARLIN, W. J. STUDDEN, *Tchebycheff systems: With applications in analysis and statistics*, Pure and Applied Mathematics, Vol. XV, Interscience Publishers John Wiley & Sons, New York–London–Sydney, 1966.
- [11] M. KUCZMA, *An Introduction to the Theory of Functional Equations and Inequalities*, Prace Naukowe Uniwersytetu Śląskiego w Katowicach, vol. 489, Państwowe Wydawnictwo Naukowe — Uniwersytet Śląski, Warszawa–Kraków–Katowice, 1985.
- [12] D. S. MITRINOVIĆ, I. B. LACKOVIĆ, *Hermite and convexity*, Aequationes Math. **28**, (1985), 229–232.
- [13] Zs. PÁLES, *Hölder-type inequalities for quasiarithmetic means*, Acta Math. Hungar., **47**, (1986), 395–399.
- [14] Zs. PÁLES, *Strong Hölder and Minkowski inequalities for quasiarithmetic means*, Acta Sci. Math. (Szeged) **65**, 3-4 (1999), 493–503.
- [15] Zs. PÁLES, *Nonconvex functions and separation by power means*, Math. Inequal. Appl. **3**, 2 (2000), 169–176.
- [16] T. POPOVICIU, *Les fonctions convexes*, Hermann et Cie, Paris, 1944.