

ON CONVEX FUNCTIONS OF HIGHER ORDER

ATTILA GILÁNYI AND ZSOLT PÁLES

Abstract. Based on J. L. W. V. Jensen's concept of convex functions as well on its generalization by E. M. Wright and related to T. Popoviciu's convexity notions, higher-order convexity properties of real functions are introduced and surveyed.

Mathematics subject classification (2000): 26A51, 26A48, 39B62.

Key words and phrases: Jensen-convexity, convexity of higher order, Wright-convexity.

REFERENCES

- [1] E. F. BECKENBACH, *Generalized convex functions*, Bull. Amer. Math. Soc. **43** (1937), 363–371.
- [2] S. BOYD, L. VANDENBERGHE, *Convex Optimization*, Cambridge University Press, Cambridge, 2004.
- [3] P. S. BULLEN, D. S. MITRINOVIĆ AND P. M. VASIĆ, *Means and Their Inequalities*, D. Reidel Publ. Co., Dordrecht, 1988.
- [4] Z. DARÓCZY AND ZS. PÁLES, *Convexity with given infinite weight sequences*, Stochastica **11** (1987), no. 1, 5–12.
- [5] B. DE FINETTI, *Sulle stratificazioni convesse*, Ann. Mat. Pura Appl. [4] **30** (1949), 173–183.
- [6] A. GILÁNYI AND ZS. PÁLES, *On Dinghas-type derivatives and convex functions of higher order*, Real Anal. Exchange **27** (2001/2002), 485–493.
- [7] 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.
- [8] J. HADAMARD, *Sur les fonctions entières*, Bull. Soc. Math. France **24** (1896), 186–187.
- [9] G. HAMEL, *Eine Basis aller Zahlen und die unstetigen Lösungen der Funktionalgleichung $f(x+y) = f(x) + f(y)$* , Math. Ann. **60** (1905), 459–462.
- [10] M. O. HÖLDER, *Über einen Mittelwertsatz*, Nachr. Ges. Wiss. Göttingen, 1889, 38–47.
- [11] J. L. W. V. JENSEN, *Om konvekse funktioner og uligheder imellem middelveerdier*, Nyt. Tidsskrift for Matematik **16 B** (1905), 49–69.
- [12] J. L. W. V. JENSEN, *Sur les fonctions convexes et les inégalités entre les valeurs moyennes*, Acta Math. **30** (1906), 175–193.
- [13] M. KUCZMA, *An Introduction to the Theory of Functional Equations and Inequalities*, Państwowe Wydawnictwo Naukowe — Uniwersytet Śląski, Warszawa–Kraków–Katowice, 1985.
- [14] N. KUHN, *A note on t -convex functions*, General Inequalities, 4 (Oberwolfach, 1983) (W. Walter, ed.), International Series of Numerical Mathematics, vol. 71, Birkhäuser, Basel–Boston–Stuttgart, 1984, pp. 269–276.
- [15] GY. MAKSA, K. NIKODEM, AND ZS. PÁLES, *Results on t -Wright convexity*, C. R. Math. Rep. Acad. Sci. Canada **13** (1991), no. 6, 274–278.
- [16] J. MATKOWSKI AND M. WRÓBEL, *A generalized a -Wright convexity and related functional equation*, Ann. Math. Sil. (1996), no. 10, 7–12.
- [17] D. S. MITRINOVIĆ, J. E. PEČARIĆ, AND A. M. FINK, *Classical and New Inequalities in Analysis*, Kluwer Acad. Publ., Dordrecht, 1993.
- [18] C. P. NICULESCU AND L.-E. PERSSON, *Convex functions and their applications. A contemporary approach*, CMS Books in Mathematics/Ouvrages de Mathématiques de la SMC, **23**, Springer, New York, 2006.
- [19] K. NIKODEM AND ZS. PÁLES, *On t -convex functions*, Real Anal. Exchange, **29** (2003/2004), 219–228.

- [20] T. POPOVICIU, *Sur quelques propriétés des fonctions d'une ou de deux variables réelles*, *Mathematica (Cluj)* **8** (1934), 1–85.
- [21] T. POPOVICIU, *Les fonctions convexes*, Hermann et Cie, Paris, 1944.
- [22] R. T. ROCKAFELLAR, *Convex Analysis*, Princeton University Press, Princeton, N. J. 1970.
- [23] A. W. ROBERTS AND D. E. VARBERG, *Convex Functions*, Academic Press, New York–London, 1973.
- [24] O. STOLZ, *Grundzüge der Differential- und Integralrechnung I*, Teubner, Leipzig, 1893.
- [25] E. M. WRIGHT, *An inequality for convex functions*, *Amer. Math. Monthly* **61** (1954), 620–622.