

## INEQUALITIES AND MONOTONICITY PROPERTIES FOR SOME SPECIAL FUNCTIONS

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*Abstract.* The monotonicity, convexity, log-convexity and complete monotonicity properties for some special functions are proved, and some inequalities are established.

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### REFERENCES

- [1] *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables*, M. Abramowitz and I. A. Stegun (Eds.), National Bureau of Standards, Applied Mathematics Series **55**, 4th printing, with corrections, Washington, 1965.
- [2] G. ALLASIA, C. GIORDANO AND J. PEČARIĆ, *Inequalities for the gamma function relating to asymptotic expansions*, Math. Inequal. Appl., **5**, 3 (2002), 543–555.
- [3] H. ALZER, Inequalities for the gamma and polygamma functions, Abh. Math. Sem. Univ. Hamburg, **68** (1998), 363–372.
- [4] G. D. ANDERSON, R. W. BARNARD, K. C. RICHARDS, M. K. VAMANAMURTHY AND M. VUORINEN, *Inequalities for zero-balanced hypergeometric functions*, Trans. Amer. Math. Soc., **347**, 5 (1995), 1713–1723.
- [5] G. D. ANDERSON, M. K. VAMANAMURTHY AND M. VUORINEN, *Topics in special functions*, Papers on analysis, 5–26, Rep. Univ. Jyväskylä Dep. Math. Stat., 83, Univ. Jyväskylä, Jyväskylä, 2001.
- [6] D. W. DETEMPLE, *A quicker convergence to Euler's constant*, Amer. Math. Monthly, **100**, 5 (1993), 468–470.
- [7] A. M. FINK, *Kolmogorov-Landau inequalities for monotone functions*, J. Math. Anal. Appl., **90** (1982), 251–258.
- [8] J.W.L. GLAISHER, *History of Euler's constant*, Messenger of Math., vol. **1** (1872), p. 25–30.
- [9] G. H. HARDY AND E. M. WRIGHT, *An Introduction to the Theory of Numbers*, Oxford Science Publications, 1979.
- [10] E. A. KARATSUBA, *On the computation of the Euler constant  $\gamma$* , Numer. Algorithms, **24** (2000), 83–97.
- [11] A. LAFORGIA AND P. NATALINI, *On some Turán-type inequalities*, J. Inequal. Appl., 2006, Art. ID 29828, 6 pp. Available online at <http://www.hindawi.com/GetArticle.aspx?doi=10.1155/JIA/2006/29828>.
- [12] S. R. TIMS AND J. A. TYRRELL, *Approximate evaluation of Euler's constant*, Math. Gaz., **55**, 391 (1971), 65–67.
- [13] D. V. WIDDER, *The Laplace Transform*, Princeton Univ. Press, Princeton, 1941.
- [14] R. M. YOUNG, *Euler's Constant*, Math. Gaz., **75** (1991), 187–190.