

## ON A NEW FAMILY OF BIVARIATE MEANS II

EDWARD NEUMAN

**Abstract.** Lower and upper bounds as well as inequalities satisfied by members of a family of bivariate means, introduced recently by this author in [18], are established. In particular, optimal convex combinations bounds are obtained. Also, the Wilker and Huygens-type inequalities involving means under discussion are obtained.

**Mathematics subject classification (2010):** 26E60, 26A09, 26D05.

**Keywords and phrases:** Schwab-Borchardt mean, Wilker and Huygens-type inequalities, lower and upper bounds.

### REFERENCES

- [1] M. ABRAMOWITZ, A. I. STEGUN, *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables*, Ninth printing, Dover Publications Inc., New York, 1970.
- [2] G. D. ANDERSON, M. K. VAMANAMURTHY, M. VUORINEN, *Monotonicity rules in calculus*, Amer. Math. Monthly **133** (2006), 805–816.
- [3] B. A. BHAYO, J. SÁNDOR, *On certain old and new trigonometric and hyperbolic inequalities*, Analysis Math. **41** (2015), 3–15.
- [4] M. BIERNACKI, J. KRZYŻ, *On the monotonicity of certain functionals in the theory of analytic functions*, Ann. Univ. Mariae Curie – Skłodowska **2** (1955), 134–145.
- [5] J. M. BORWEIN, P. B. BORWEIN, *Pi and the AGM - A Study in Analytic Number Theory and Computational Complexity*, Wiley, New York, 1987.
- [6] B. C. CARLSON, *Algorithms involving arithmetic and geometric means*, Amer. Math. Monthly **78** (1971), 496–505.
- [7] E. NEUMAN, *Inequalities for the Schwab-Borchardt mean and their applications*, J. Math. Inequal. **5**, 4 (2011), 601–609.
- [8] E. NEUMAN, *Inequalities for weighted sums of powers and their applications*, Math. Inequal. Appl. **15**, 4 (2012), 995–1005.
- [9] E. NEUMAN, *Refinements and generalizations of certain inequalities involving trigonometric and hyperbolic functions*, Adv. Inequal. Appl. **1** (2012), 1–11.
- [10] E. NEUMAN, *A note on a certain bivariate mean*, J. Math. Inequal. **6**, 4 (2012), 637–643.
- [11] E. NEUMAN, *A one-parameter family of bivariate means*, J. Math. Inequal. **7**, 3 (2013), 399–412.
- [12] E. NEUMAN, *Sharp inequalities involving Neuman-Sándor and logarithmic means*, J. Math. Inequal. **7**, 3 (2013), 413–419.
- [13] E. NEUMAN, *On a new bivariate mean*, Aequat. Math. **88** (2014), 277–289.
- [14] E. NEUMAN, *On some means derived from the Schwab-Borchardt mean*, J. Math. Inequal. **8**, 1 (2014), 171–183.
- [15] E. NEUMAN, *On some means derived from the Schwab-Borchardt mean II*, J. Math. Inequal. **8**, 2 (2014), 359–368.
- [16] E. NEUMAN, *Inequalities and bounds for a certain bivariate elliptic mean*, Math. Inequal. Appl. **19**, 4 (2016), 1375–1385.
- [17] E. NEUMAN, *On two bivariate elliptic means*, J. Math. Inequal. **11**, 2 (2017), 345–354.
- [18] E. NEUMAN, *On a new family of bivariate means*, J. Math. Inequal. **11**, 3 (2017), 673–681.
- [19] E. NEUMAN, J. SÁNDOR, *On the Schwab-Borchardt mean*, Math. Pannon. **14**, 2 (2003), 253–266.
- [20] E. NEUMAN, J. SÁNDOR, *On the Schwab-Borchardt mean II*, Math. Pannon. **17**, 1 (2006), 49–59.

- [21] E. NEUMAN, J. SÁNDOR, *On some inequalities involving trigonometric and hyperbolic functions with emphasis on the Cusa-Huygens, Wilker and Huygens inequalities*, Math. Inequal. Appl. **13**, 1 (2010), 715–723.
- [22] H.-J. SEIFFERT, *Problem 887*, Nieuw. Arch. Wisk. **11** (1993), 176.
- [23] H.-J. SEIFFERT, *Aufgabe 16*, Würzel **29** (1995), 87.