

## PROOFS OF CERTAIN CONJECTURES OF VUKŠIĆ CONCERNING THE INEQUALITIES FOR MEANS

CHAO-PING CHEN AND NEVEN ELEZOVIĆ

*Abstract.* By using the asymptotic expansion method, Vukšić conjectured inequalities between Seiffert means and convex combinations of other means. In this paper, we prove certain conjectures given by Vukšić.

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

*Keywords and phrases:* Seiffert means, inequality.

### REFERENCES

- [1] M. ABRAMOWITZ AND I. A. STEGUN (Eds.), *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables*, National Bureau of Standards, Applied Mathematics Series **55**, 9th printing, Washington, 1970.
- [2] G. D. ANDERSON, M. K. VAMANAMURTHY AND M. VUORINEN, *Inequalities for quasiconformal mappings in space*, *Pacific J. Math.* **160** (1993), 1–18.
- [3] G. D. ANDERSON, S.-L. QIU, M. K. VAMANAMURTHY AND M. VUORINEN, *Generalized elliptic integral and modular equations*, *Pacific J. Math.* **192** (2000), 1–37.
- [4] T. BURIĆ, N. ELEZOVIĆ, *Asymptotic expansion of Arithmetic-Geometric mean*, *J. Math. Inequal.* **9**, 4 (2015), 1181–1190.
- [5] Y. M. CHU, Y. F. QIU, M. K. WANG AND G. D. WANG, *The optimal convex combination bounds of arithmetic and harmonic means for the Seiffert's mean*, *J. Inequal. Appl.* **2010**, Article ID 436457, 7 pages.
- [6] Y. M. CHU, M. K. WANG AND W. M. GONG, *Two sharp double inequalities for Seiffert mean*, *J. Inequal. Appl.* **2011**, 44, 7 pages.
- [7] Y. M. CHU, C. ZONG AND G. D. WANG, *Optimal convex combination bounds of Seiffert and geometric means for the arithmetic mean*, *J. Math. Inequal.* **5** (2011), 429–434.
- [8] A. CUYT, V. B. PETERSEN, B. VERDONK, H. WAADELAND AND W. B. JONES, *Handbook of Continued Fractions for Special Functions*, Springer, New York, 2008.
- [9] N. ELEZOVIĆ, *Asymptotic inequalities and comparison of classical means*, *J. Math. Inequal.* **9**, 1 (2015), 177–196.
- [10] N. ELEZOVIĆ, *Asymptotic expansions of gamma and related functions, binomial coefficients, inequalities and means*, *J. Math. Inequal.* **9**, 4 (2015), 1001–1054.
- [11] N. ELEZOVIĆ AND L. VUKŠIĆ, *Asymptotic expansions of bivariate classical means and related inequalities*, *J. Math. Inequal.* **8**, 4 (2014), 707–724.
- [12] N. ELEZOVIĆ AND L. VUKŠIĆ, *Neuman-Sandor means, asymptotic expansions and related inequalities*, *J. Math. Inequal.* **9**, 4 (2015), 1337–1348.
- [13] N. ELEZOVIĆ, L. MIHOKOVIĆ, *Asymptotic behaviour of power means*, *Math. Inequal. Appl.* **19**, 4 (2016), 1399–1412.
- [14] S.-Q. GAO, H.-Y. GAO AND W.-Y. SHI, *Optimal convex combination bounds of the centroidal and harmonic means for the Seiffert mean*, *Int. J. Pure Appl. Math.* **70** (2011), 701–709.
- [15] H. LIU AND X. J. MENG, *The optimal convex combination bounds for Seiffert's mean*, *J. Inequal. Appl.* **2011**, Art. ID 686834, 9 pages.
- [16] H.-J. SEIFFERT, *Problem 887*, *Nieuw Arch. Wiskunde*, **11** (1993), 176.

- [17] H.-J. SEIFFERT, *Aufgabe  $\beta$ 16*, *Wurzel*, **29** (1995), 221–222.
- [18] L. VUKŠIĆ, *Seiffert means, asymptotic expansions and inequalities*, *Rad Hrvat. Akad. Znan. Umjet. Mat. Znan.* **19** (2015), 129–142.
- [19] A. WITKOWSKI, *Interpolations of Scwab-Borchardt mean*, *Math. Ineq. Appl.* **16**, 1 (2013), 193–206.