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Corrigendum to "Some analytical properties of the hyperbolic sine integral"

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Abstract. We correct an error in Theorem 2.5 of the paper "Some analytical properties of the hyperbolic sine integral" [Mathematical Analysis and its Contemporary Applications, 6(1)(2024), 1-14]. This correction does not affect other results of the paper.

Keywords: Hyperbolic sine integral function; hyperbolic functions; hyperbolic sinc function; bounds; inequalities
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1. Introduction

Theorem 2.5 of [1] as presented contains an error. The error has to do with the inequality sign ">" in [1, eqn (13)] which is supposed to be "<". In the following theorem, we correct the error.

Theorem 1.1. *Let $z > 0$ and $\lambda \in (0, 1)$. Then the inequality*

$$\operatorname{Shi}(\lambda z) < \lambda \operatorname{Shi}(z) \tag{1}$$

holds. If $\lambda > 1$, then the inequality is reversed.

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PROOF. Let $\alpha(z) = \text{Shi}(\lambda z) - \lambda \text{Shi}(z)$ for $z > 0$ and $\lambda \in (0, 1)$. Then

$$\alpha'(z) = \lambda \left[\text{Shi}'(\lambda z) - \text{Shi}'(z)\right] < 0$$

since $\text{Shi}'(z)$ is increasing for $z > 0$. Hence $\alpha(z)$ is decreasing. Therefore, we have

$$\alpha(z) < \lim_{z \to 0^+} \alpha(z) = 0$$

which gives (1). The reverse case is obtained by the same procedure. □

References

[1] K. Nantomah, *Some analytical properties of the hyperbolic sine integral*, Math. Anal. Contemp. Appl., **6**(1) (2024), 1-14.

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