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Errata to "Comparison of Smallest Eigenvalues for Fractional-Order Nonlocal Boundary Value Problems"

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Abstract

In the article "Comparison of smallest eigenvalues for fractional-order nonlocal boundary value problems", published in Advances in Dynamical Systems and Applications, Volume 14, Number 2, pp. 189–199 (2019), an error was made concerning the left boundary condition. This errata addresses that error.

AMS Subject Classifications: 26A33, 34A08, 34B05, 34B09, 34B10.
Keywords: Riemann–Liouville linear differential equation, fractional order, eigenvalue comparison, nonlocal boundary condition.

Concerning the results of the paper [3], an error was brought to the attention of the authors by Professor Jeffrey Webb. In particular, for a Riemann–Liouville fractional derivative problem studied via an integral equation in the space $C[0,1]$, only the initial value $y(0) = 0$ gives a well-posed problem. As a consequence, the phrase on [3, page 192] preceding the expression for $G(t,s)$ that states, "Extending arguments of Henderson and Luca [16, 19], we obtain by direct computation that the Green's function for (3.1)–(1.3) is given by $\ldots$," is in error. Namely, in each of [16] and [19], the boundary condition at $t = 0$ involves $y(0) = 0$, and the computation of the Green's function in each of those papers does not lead to the expression for $G(t,s)$ given on [3, page

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192]. By replacing the boundary condition in (1.3) at $t = 0$ by $y(0) = 0$ and then deleting the corresponding terms from the expression for $G(t, s)$ on [3, page 192] and employing the weighted Banach space $B = \{y : y = t^{\alpha-1}v,\ v \in C[0, 1]\}$ with norm $\|y\| = \sup_{t\in[0,1]} |v(t)|$, standard arguments show $M, N : P \setminus \{0\} \to Q$, where

$$Q := \{y = t^{\alpha-1}v \in B :\ y(t) > 0,\ t \in (0, 1],\ v(0) > 0\} \subset P^{\circ},$$

which provides a correction for the results of [3]. Useful references supporting this correction are [1, 2, 4–7].

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