

Existence and stability of positive solutions for a Hadamard-type fractional two-point boundary value problem

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Abstract

In this paper, we mainly establish existence and uniqueness of positive solution for the Hadamard-type fractional two-point boundary value problem $(\mathcal{D}^{\alpha}_{1+}x(t))' + \lambda \mathcal{D}^{\alpha}_{1+}x(t) + f(t, x(t), -\mathcal{D}^{\alpha}_{1+}x(t)) = 0, t \in [1, e], x(1) = x'(1) = x'(e) = 0, \mathcal{D}^{\alpha+1}_{1+}x(1) = \mathcal{D}^{\alpha+1}_{1+}x(e) = 0$, by using the fixed point theorems. In addition, we also study the Ulam-Hyers-Rassias stability of the related problem. On the other hand, when $f(t, u, v)$ is singular at $u=0$ and $v=0$, we study the existence and uniqueness of its solution. Finally, some examples are included to show the applicability of our results.

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