

Existence and uniqueness results for Multiplicative Fractional differential equation with three point integral boundary value problem

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Abstract: Fractional differential equations have been a hot topic of recent years since it found many applications ranging from Biology, Chemistry, Engineering, physics, control theory, Electrical circuits [2]. On the other hand, the concept of multiplicative calculus which was well established in [1] is another active research area since it provides an interesting aspects of the known phenomena of mathematics and provide important achievement in some areas such as Numerical Analysis, Fractional and complex analysis. Furthermore, this topic starts to find many applications in economics , Image processing and functional Analysis. Recently, the multiplicative fractional differentiation and integration have been defining in [3] and in this paper, we focus on the investigation of the existence and uniqueness of multiplicative fractional differential equation with three point boundary value problem below;

$$\begin{aligned} {}_c^*D^q x(t) &= f(t, x(t)) \\ x(0) &= 1 \\ x(1) &= \left(\int_0^\eta x(s)^{ds} \right)^\alpha \end{aligned}$$

the most important note is that Multiplicative fractional calculus is established for some differential equations with non-linear continuous function. Additionally the multiplicative analogue of the solution of BVP is defined.

Keywords: multiplicative, fractional calculus, three point BVP, Caputo derivative, differential equation.

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