A New Applicable Method for Solving Fractional Differential Equations

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Abstract

This paper presents a new idea to solve fractional differential equation based on the linear programming problem. Indeed, by using the first concept of fractional derivative, we will suggest a method where an equation with fractional derivative is changed to linear programming and by solving it, the fractional derivative will be obtained. Actually this suggested method is based on the minimization of total error. Also some numerical examples are provided to confirm the accuracy of the proposed method.

Keywords: Fractional calculus, fractional differential equation, Linear programming
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1 Introduction

It is difficult to solve a differential equation exactly, so recently some approximated methods were presented to solve them, for instance Homotopy Interfrence method, Homotopi analytical method, and numerical methods. Most of the researches present different methods to formulate and model the physical structures. In last years, science and engineering scientists paid attention to fraction calculations.Usages of fractional differential equations in physics and engineering significantly have increased. Many phenomena, in various fields, can be modeled by fractional differential equations, like some in control problems, statistical models, economic issues, electromagnetism, electrochemistry, telecommunication lines and so on.

Fractional calculation is generalization of ordinary derivative and integral which has non- integer arbitrary order. History of these problems like differential calculus back to the time when Leibniz and Newton invented differential calculus. Fraction calculus has introduced in September 30 of 1695 for the first time [1]. In 1812, Laplace defined a fraction integral as a fractional derivative [2]. In 1819, the first description of a fractional derivative was written by Lacroix in computational version [3]. First step in expanding differential arbitrary functions was by Fourier in 1822 [4]. But the first theorem was written by Liouville in 1823. The famous formula which is useful today named RiemannLiouville integral inserted by Reimann in 1847. Next we will describe some definitions in fractional derivatives concept.

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