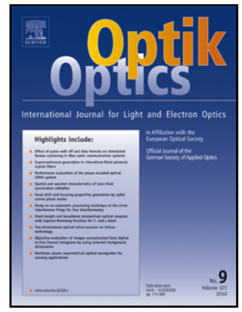
Accepted Manuscript



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Author: Emrah Ünal Ahmet Gökdoğan

PII: S0030-4026(16)31187-1
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2016.10.031
Reference: IJLEO 58299

To appear in:

Received date: 8-8-2016
Accepted date: 7-10-2016

Please cite this article as: Emrah Ünal, Ahmet Gökdoğan, Solution of Conformable Fractional Ordinary Differential Equations via Differential Transform Method, Optik - International Journal for Light and Electron Optics http://dx.doi.org/10.1016/j.ijleo.2016.10.031

Solution of Conformable Fractional Ordinary Differential Equations via Differential Transform Method

Emrah Ünal[a], Ahmet Gökdoğan[b]

[a] Department of Elementary Education, Artvin Çoruh University, 08100 Artvin, Turkey

emrah.unal@artvin.edu.tr

[b] Department of Mathematical Engineering, Gümüşhane University, 29100 Gümüşhane, Turkey,

gokdogan@gumushane.edu.tr

Abstract

Recently, a new fractional derivative called the conformable fractional derivative is given which is based on the basic limit definition of the derivative in [1]. Then, the fractional versions of chain rules, exponential functions, Gronwall's inequality, integration by parts, Taylor power series expansions is developed in [2]. In this paper, we give conformable fractional differential transform method and its application to conformable fractional differential equations.

Key words : Conformable Fractional Derivative, Fractional power series, Conformable Fractional Differential Transform Method, Conformable Fractional Ordinary Differential Equations

1. Introduction

Despite becoming a popular topic in recent years, the concept of fractional derivatives has emerged in the late 17th century. Several definitions have been made to define the fractional derivative and continues to be done. Most popular definitions in this area are the Riemann-Liouville, Caputo and Grunwald-Letnikov definitions. These definitions are defined as, respectively,

(I) Riemann Liouville definition:

$$D_x^\alpha f(x) = \frac{1}{\Gamma(n-\alpha)}\left(\frac{d}{dx}\right)^n \int_0^x (x-t)^{n-\alpha-1} f(t)dt\,, \qquad n-1<\alpha\leq n$$

(II) Caputo definition:

$$D_x^\alpha f(x) = \frac{1}{\Gamma(n-\alpha)} \int_0^x (x-t)^{n-\alpha-1} f^{(n)}(t)dt\,, \qquad n-1<\alpha\leq n$$

(III) Grunwald-Letnikov definition:

$${}_aD_x^\alpha f(x) = \lim_{h\to 0} h^{-\alpha} \sum_{j\to 0}^{\frac{x-a}{h}} (-1)^j \binom{\alpha}{j} f(x-jh)$$