World Academy of Science, Engineering and Technology
International Journal of Physical and Mathematical Sciences
Vol:13, No:12, 2019

Nonhomogeneous Linear Fractional Differential Equations Will Bessel Functions of the First Kind Giving Hypergeometric Functions Solutions

Authors : Fernando Maass, Pablo Martin, Jorge Olivares

Abstract : Fractional derivatives have become very important in several areas of Engineering, however, the solutions of simple differential equations are not known. Here we are considering the simplest first order nonhomogeneous differential equations with Bessel regular functions of the first kind, in this way the solutions have been found which are hypergeometric solutions for any fractional derivative of order α, where α is rational number α=m/p, between zero and one. The way to find this result is by using Laplace transform and the Caputo definitions of fractional derivatives. This method is for values longer than one. However for α entire number the hypergeometric functions are Kumer type, no integer values of alpha, the hypergeometric function is more complicated is type ${}_2F_3(a,b,c, t2/2)$. The argument of the hypergeometric changes sign when we go from the regular Bessel functions to the modified Bessel functions of the first kind, however it integer seems that using precise values of α and considering no integers values of α, a solution can be obtained in terms of two hypergeometric functions. Further research is required for future papers in order to obtain the general solution for any rational value of α.

Keywords : Caputo, fractional calculation, hypergeometric, linear differential equations
Conference Title : ICPMSEA 2019 : International Conference on Physical, Mathematical Sciences and Engineering Applications
Conference Location : Barcelona, Spain
Conference Dates : December 16-17, 2019