

1116-41-2949

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A new numerical method for solving the fractional integro-differential equations is given. This method is based on using fractional Taylor vector approximation. The operational matrix of the fractional integration for fractional Taylor vector is found and is utilized to reduce the solution of the fractional integro-differential equations to a system of algebraic equations. Illustrative examples demonstrates the validity and applicability of this technique. (Received September 23, 2015)