

# **Analysis of fractional Cauchy reaction-diffusion equations using an efficient method**

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**Abstract** In this paper, we find the solution for the fractional Cauchy reaction-diffusion equations using fractional natural decomposition method (FNDM). The projected method is the graceful amalgamations of natural transform with Adomian decomposition technique. Five distinct examples are considered with different initial conditions to illustrate the efficiency as well as exactness of the solution procedure. To validate and illustrate the proficiency of the projected solution procedure, we analysed the projected model in terms of fractional order. Further, we captured the nature of FNDM results for different value of fractional order in terms of the plots. The considered scheme highly effective and structured while analysing the real-world models and which can be observed and confirm from the obtained results. Moreover, with the help of numerical simulation, we ensure that as the order of iterative solution increase then achieved results converges towards the exact solution. The captured plots show that the hired fractional operator and algorithm can help to exemplify the more fascinating consequences of the considered model.

**Keywords:** Caputo derivative; Cauchy reaction-diffusion; fractional natural decomposition method