

Convergence of Sinc Methods Applied to Kuramoto-Sivashinsky Equation

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Abstract : A comparative study of the Sinc-Galerkin and Sinc-Collocation methods for solving the Kuramoto-Sivashinsky equation is given. Both approaches depend on using Sinc basis functions. Firstly, a numerical scheme using Sinc-Galerkin method is developed to approximate the solution of Kuramoto-Sivashinsky equation. Sinc approximations to both derivatives and indefinite integrals reduces the solution to an explicit system of algebraic equations. The error in the solution is shown to converge to the exact solution at an exponential. The convergence proof of the solution for the discrete system is given using fixed-point iteration. Secondly, a combination of a Crank-Nicolson formula in the time direction, with the Sinc-collocation in the space direction is presented, where the derivatives in the space variable are replaced by the necessary matrices to produce a system of algebraic equations. The methods are tested on two examples. The demonstrated results show that both of the presented methods more or less have the same accuracy.

Keywords : Sinc-Collocation, nonlinear PDEs, numerical methods, fixed-point

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