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Talk Sinc-Galerkin method for solving parabolic equations pp.: 1–4

Sinc-Galerkin method for solving parabolic equations

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Abstract

In this paper Sinc-galerkin method is used for a class of time-dependent parabolic equation. The method based on double exponential transformation(DE) and used for both space and time directions and it has been tested the accuracy of method on an example. Finally the obtained results based on DE transformation compared with this method based on single exponantial transformation(SE) . The results confirm that the accurate nature of our method .

Keywords: Sinc-Galerkin, double exponential transformation, parabolic equation, numerical comparision

1 Introduction

We consider the one dimentional time-depndent parabolic equation

$$\frac{\partial}{\partial t}u(x,t) + H(x)\frac{\partial}{\partial x}u(x,t) + R(x)\frac{\partial^2}{\partial x^2}u(x,t) = f(x,t), \tag{1}$$

$$u(x,\circ) = g(x) \qquad a < x < b \ , \ u(a,t) = \gamma(t) \ , \ u(b,t) = \delta(t), \ \ t > \circ$$

convection-diffusion and heat equation are a special model of this model.Many methods have been propsed for this type of equation that mixed Sinc-Galerkin with other methods and also in [2] there are some kind of this problem that solved by Sinc-Galerkin method based on SE transformation.

2 Sinc-Galerkin method

We explain the method on a heat equation with homogenious boundary conditions,but the method can be applied for other parabolic equations

$$\frac{\partial}{\partial t}u(x,t) - \frac{\partial^2}{\partial x^2}u(x,t) = f(x,t) \ \ , \ \ u(0,t) = u(t,b) = 0 \ \ \ t > \circ \ \ , \ \ u(0,x) = 0 \quad 0 < x < 1 \tag{2}$$

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