1 Problem Set I solving wave equation

$$\frac{\partial^2 \phi}{\partial^2 t} = c^2 \frac{\partial^2 \phi}{\partial^2 x} \tag{1}$$

1.1 fully first order formulation

$$\eta = \phi_{,t}, \quad \chi = \phi_{,x} \tag{2}$$

$\eta(t,x)\chi(t,x)\vec{u}(\phi,\eta,\chi)$

$$\vec{u}_{,t} + \mathbf{A}\vec{u}_{,x} = \vec{S} \tag{3}$$

1.2 initial condition

$$\phi(0,x) = e^{\sin^2\left(\frac{\pi x}{L}\right)} - 1, \quad 0 \leq x \leq L \tag{4}$$

with periodic condition:

$$\phi(t,x) = \phi(t, x \pm L) \tag{5}$$

2 Program