MTH4033 HW5 (Fall 2022)

Professor Youngjoon Hong — Due Date: November. 11 (11:59 pm)

Problem 1 *(Numerics) Solve the initial boundary value problem*

$$u_t + u_x = 0, \quad 0 \le x \le 1, \quad t \ge 0,$$

with the leapfrog scheme and the following boundary conditions:
(a). At $x = 0$, specify $u(t, 0)$; at $x = 1$, use boundary condition

$$v_M^{n+1} = 2v_{M-1}^{n+1} - v_{M-2}^{n+1}.$$

(b). At $x = 0$, specify $u(t, 0)$; at $x = 1$, use boundary condition

$$v_M^{n+1} = v_{M-1}^n.$$

For numerical tests, use the exact solution as $\sin 2\pi(x - t)$ with $k = 0.02$, $T = 0.5$, and $\lambda = 0.9$.

Write a numerical code for Problem 1 and submit your fully working code to me at hongyj@g.skku.edu. The title of your email should contain student number, your name, course number; e.g., "2022160301 Heung-min Son MTH4033HW5".