Homework 9 – MATH 5602

March 15, 2013

1. Consider the system

$$\mathbf{u}_t = \begin{bmatrix} 1 & 4 \\ 1 & 1 \end{bmatrix} \mathbf{u}_x, \quad 0 \le x \le 1,$$

with periodic boundary condition and initial condition $\mathbf{u}(x,0) = \begin{bmatrix} \cos 2\pi x \\ \sin 2\pi x \end{bmatrix}$.

a. Write out the exact solution.

b. Use upwind scheme to solve the system.

c. Compare your solution with the exact solution you derived in a).