Math 269B: Assignment 6

Assigned Friday Jan 22, due Friday Feb 29

Theory

[1], [2] Problems 6.3.7, 7.1.4 of Strikwerda.

[3] Find the exact solution for the problem

$$\begin{aligned} u_t &= u_{xx} \quad \textit{for } 0 < x < \pi, 0 < t < 1 \\ u(0, x) &= \sin(x) \\ u(t, 0) &= u(t, \pi) = 0 \end{aligned}$$

Computation

[4] Implement the forward-time, central space scheme (which is explicit) and the backward time, central space scheme (which is implicit), for the 1D heat equation in [3]. For the implicit method you can use the tridiagonal solver that you wrote for the Crank-Nicolson method. Solve with two values for (h,k): one in the region of stability for the explicit method and one outside that region. Plot the solution and the error in solution, using the exact solution from above.

What You Should Turn In

- Answers to the theoretical problems.
- The graphs for the computational problem **4** and a listing of your program.