Homework 6: Diffusion Equation

Due March 21, Thursday of Exam Week.

1. Write a program to solve the diffusion problem:

$$\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$$

   for $u(x,t)$ with the boundary conditions

$$u(0,t) = 200, \quad u(1,t) = 200, \quad u(x,0) = 0.$$

   using the explicit forward differencing method described in text with $\Delta x = 0.2$ (Forward-Time Central-Space method in the book).

2. Plot the results for $u(0.4, t)$ for $0 < t < 0.4$ for two different timesteps: $\Delta t = 0.04$ and 0.01. How do these two timesteps compare with the stability criterion for the forward difference method?

   Also plot the results for $u(x, 0.12)$ and $u(x, 0.4)$.