For Monday (12/4):

Hand in: Apply the Crank-Nicolson method to the previous homework problem:

$$\frac{\partial u}{\partial t} - \frac{\partial^2 u}{\partial x^2} = 0, \quad u(0, t) = u(2, t) = 0, \quad u(x, 0) = \sin \frac{\pi}{2} x,$$

Compute the solution out to $t=0.6$. As step sizes, use $h = 0.5$, and $\Delta t = 0.1$ and 0.2. Compare with the results from the forward-difference and backward-difference methods.

Read: ADI method.

Consider: Estimate the temperature distribution of a square plate by the ADI method. The left edge of the plate is held at $0^\circ$C and the other three at $10^\circ$C. Use a mesh spacing that is $\frac{1}{3}$ the length of the edges, and start from an initial guess of $0^\circ$C everywhere. Use $\rho = 1$ and do one iteration (an odd and an even sweep).

For Wednesday (12/6):

Hand in: Carry out the ADI calculation started in class to enough iterations to see convergence.

Read: time-dependent Schrödinger equation.

Consider: Set up Crank-Nicolson difference equations for the time-dependent Schrödinger equation

$$\frac{i\hbar}{\partial t} \Psi(x, t) = -\frac{\hbar^2}{2m} \frac{\partial^2}{\partial x^2} \Psi(x, t) + V(x) \Psi(x, t).$$

Combine them into matrix form.

For Friday (12/8):

Consider: questions for final exam.

For Monday (12/11): take-home final due at noon.