MATH 562
Homework 1
Due Tuesday February 5

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"One must learn by doing the thing – for though you think you know it you have no certainty until you try."

Sophocles

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Page 203: Problem 3. (Hint: You will have to use the value of the function at more than two points.)

Page 209-210: Problem 1, Problem 7, Problem 10 and Problem 13.

Problem 6: Repeat Problem 1 of page 209 but take $\Delta x = 0.1$. What must Δt be to insure stability? Compute the solution up to time $t = 1$. Repeat this calculation using the implicit scheme which approximates the time derivative by the backward difference approximation. Keeping $\Delta x = 0.1$, how large can you make Δt and still obtain a reasonably accurate approximation of the true solution? Compare the computation time needed to evaluate the solution at time $t = 1$ with that obtained using the explicit method.

Problem 7: Consider the approximation scheme for the heat equation given in Problem 13 on page 210. Show that if one takes allows Δx and Δt to go to zero with $\Delta t = \Delta x$ the approximation does *not* converge to the heat equation. What equation does it converge to? This is an example of a numerical scheme with is stable, but not *consistent*.