Math 462 Dr. Wolfe ASSIGNMENT #5 Due December 10, 2009

1. p. 209, Ex. 3, **Strauss**. In part (b), also solve with $\Delta t = 0.25$. Use equation (2) on p. 203. It should be possible to write a reasonably efficient MATLAB script for this. In part (a), you should need only two or three terms of the series to get the desired accuracy.

2. p. 226, Ex. 1, **Strauss**.

3. Consider the Dirichlet problem

$$\Delta u = 0,\ 0 < x < 1,\ 0 < y < 1$$

$$u(0,y) = u(1,y) = 0,\ 0 \le y \le 1,\ u(x,0) = \sin(\pi x),\ u(x,1) = e^{\pi} sin(\pi x),\ 0 \le x \le 1$$

   (a) Use a mesh $\Delta x = \Delta y = 1/4$. Write down the 9×9 system for the finite difference scheme.
   (b) Solve the system using the MATLAB operation $A\backslash b$. The matrix A can be generated efficiently using a few MATLAB commands. Arrange your solution as a 3×3 matrix corresponding to the arrangement of grid points.
   (c) Compare the values of the solution found in (b) with the values of the exact solution $u(x,y) = \sin(\pi x)e^{\pi y}$ at the grid points.