Math 124B: PDEs

Homework #6

Problem 1: Section 5.6 #1
Hint: Expand $u(x,t)$, $u_t(x,t)$, and $u_{xx}(x,t)$ as Fourier series – what eigenfunctions should you use? (Consider the boundary conditions!) Find the ODEs that each u_n satisfies ($u_n(t)$ are the Fourier coefficients of $u(x,t)$). What is the initial conditions for each u_n?

Problem 2: Section 5.6 #5
Hint: Expand $u(x,t)$, $u_{tt}(x,t)$, and $u_{xx}(x,t)$ as Fourier sine series (because you have Dirichlet boundary conditions!). Find the ODEs that each u_n satisfies. Then, using the initial conditions for u and u_t, you know what $u_n(0)$ and $u_n'(0)$ are for each n. Solve all of the ODEs with these initial conditions – you will need to consider the cases $n = 3$ and $n = 5$ separately from the rest!

Problem 3: Section 5.6 #9
Hint: Consider the function $v(x,t) = u(x,t) - h + x(h-k)$. Solve for v (using the general series solution).