ANNOUNCEMENTS:

1. You do not need to turn in the homework problems from this handout. The idea is for you to become briefly acquainted with these topics.
2. The **Final Exam** will be Tuesday, April 21st, 10-11:50 AM, in GSPH room G23. You may use one 8.5 inch by 11 inch, two-sided page of notes on the final. Calculators and other devices will not be permitted.

Section 13.1: Derivation of the Heat Equation - key concepts:

1. The heat equation is a partial differential equation that describes how the temperature of an object varies over space and time. It is a linear equation, so linear combinations of solutions are also solutions.
2. To really solve for temperature, one needs to know something about the initial temperature profile and the way the boundaries of the object will be treated. For example, the temperature may be held fixed on the boundaries (Dirichlet conditions), the boundaries may be well insulated so that there is no heat flow through them (Neumann conditions) or the boundaries may be poorly insulated so that Newton's law of cooling applies (Robin conditions).
3. The maximum principle says that the maximum and minimum temperature of an object are attained somewhere on its boundaries or else somewhere on the object at time 0.

homework: pg. 633, # 5,7,8,9.

Section 13.2: Separation of Variables for the Heat Equation - This section walks us through a method for solving the heat equation in a rod. The procedure has several steps:

1. Find the steady state temperature, which satisfies the ODE $u_{xx} = 0$ as well as the given boundary conditions.
2. Solve the PDE with homogeneous (zero) boundary conditions for its solution, call it $v(x, t)$, by writing $v(x, t) = X(x)T(t)$, substituting this into the PDE, and solving ODEs that can be obtained for X and T. It will turn out that there are infinitely many solutions, which can be combined into an infinite series.
3. Find the coefficients of the infinite series using the initial condition $u(x, 0) = g(x)$ provided for the PDE. This will be equivalent to computing a Fourier series for $g(x)$.

homework: pg. 643-4, # 1,7,11,14.