MATH 348 - Advanced Engineering Mathematics April 8, 2008
Exam II - Review **Exam II**: April 14, 2007

Exam II will be held Monday the 14^{th} in class. There will be no notecards or calculators. Exam II will test on Chapter 12 from the text. To prepare for the exam you should review the lecture notes from class, previous homework assignments and suggested problems. The exam will stress PDE's defined on a bounded domain. Each student should have memorized the following equations:

- The Homogenous Heat Equation : $u_t = c^2\nabla^2 u$.
- The Homogenous wave Equation : $u_{tt} = c^2\nabla^2 u$.
- Laplace's Equation : $\nabla^2 u = 0$.

Furthermore, each student should be familiar with the boundary conditions and initial conditions necessary for finding unique separable solutions. This will naturally require a firm understanding of:

- Separation of Variables
- Solutions to Boundary Value Problems
- Fourier Sine and Cosine Series

The following concepts/techniques will not appear on the exam:

- Power Series Solutions to ODE's
- Vibrations on a Thin Circular Membrane
- Transform Methods

The following is a list of concepts and methods which you should be familiar with.

12.1 Partial Differential Equations - Terminology

From this section the student should understand:

- The terms, linear, homogenous and order associated with a PDE.
- The concept superposition of solutions to a PDE.

From this section the student should be able to:

- Check to see if a given function is a solution to a PDE.
- Determine the type, order, homogeneity, and linearity of the PDE.
- Apply the rule of superposition.

12.3 Wave equation and its solution via Fourier Series.

From this section the student should understand:

- The physical problem.
- How the physical problem is modeled by the PDE and its boundary and initial conditions.
- The solution to the wave equation on a bounded domain.

From this section the student should be able to:

- Understand the physical interpretation of the mathematical model.

- Solve the wave equation defined on bounded physical domain via Fourier Series.
- Discuss the physical interpretations of the solution to the wave equation.

12.5 Heat equation and its solution via Fourier Series.

From this section the student should understand:

- The physical problem.
- How the physical problem is modeled by the PDE and its boundary and initial conditions.
- The solution to the heat equation on a bounded domain.

From this section the student should be able to:

- Understand the physical interpretation of the mathematical model.
- Solve the heat equation defined on bounded physical domain via Fourier Series.
- Discuss the physical interpretations of the solution to the heat equation.