

PHY 230 Midterm 3 Review

Below is a summary of the things you should know for our second midterm exam. The date of the exam is Wednesday, April 23 and will be taken in class. Below are the exam rules as they appear on the test.

Rules:

1. You may use 1 8.5×11 inch note sheet.
2. Unless otherwise noted, calculators may be used to evaluate integrals.
3. No discussion of the exam is allowed.

The exam will cover partial differential equations. Of particular importance is the method of separation of variables and how this method leads to solutions that can be found using orthogonal functions. Topics and the relevant sections are summarized below.

Laplace's Equation (13.2) You should know what the Laplacian operator is (in rectangular coordinates) and how to solve Laplace's equation.

The Heat Equation (13.3) You should be able to solve the heat equation in a thin wire of length 1. You should also be able to compute the coefficients in the solution using Fourier series methods.

The Wave Equation (13.4) You should know the wave equation and how to find its solution in 1-dimension. In particular, you should understand and be able to describe the vibrational modes and how the general solution is the superposition of these modes. You should be able to compute the coefficients in the solution using Fourier series methods.

Heat Equation in a Cylinder (13.5) You should understand how to use the method of separation of variables for Laplace's equation in cylindrical coordinates. **You do not need to know the Laplacian in cylindrical coordinates.** You should be able to compute the coefficients of the general solution with a little prompting from me.

Vibrating Circular Membrane (13.6) You should understand how to use the method of separation of variables for the wave equation in polar coordinates. **You do not need to know the Laplacian in polar coordinates.** In particular, you should understand and be able to describe the vibrational modes and how the general solution is the superposition of these modes. You should be able to compute the coefficients of the general solution with a little prompting from me.

Steady State Temperature in a Sphere (13.7) You should understand how to use the method of separation of variables for the wave equation in spherical coordinates. **You do not need to know the Laplacian in spherical coordinates.** You should be able to compute the coefficients of the general solution with a little prompting from me.

That about does it. If anyone notices anything missing or confusing, let me know via email and I will correct it, clarify it, add it, or whatever.

good luck.