Study Guide for the final exam

Prof. Tyson, Math 285 (Spring 2004)

The final exam will be cumulative. We covered Chapter 1, Chapter 2 (sections 2.1, 2.2 and 2.4), Chapter 3 (all sections except 3.7), and Chapter 9. There will be a disproportionate emphasis on the final on questions from Chapter 9, which we covered after the second midterm exam.

Topics covered since Midterm Exam II:

9.1/9.2 Fourier series (periodicity of functions, orthogonality, Fourier series and coefficients), computing infinite sums via Fourier analysis

9.3 Fourier sine and cosine series, convergence theorems for Fourier series

9.4 formal series solutions to ODE’s with boundary conditions via Fourier analysis (resonance)

9.5 the heat equation (Dirichlet and Neumann boundary conditions)

9.6 the wave equation (incl. d’Alembert’s solution)

9.7 Laplace’s equation on domains with rectilinear or polar symmetry

Material from the four IODE projects (#1, #2, #4, #5) may appear on the final exam. You should review the projects and make sure that you understand the key concepts and ideas from each one.

In addition to the skills and techniques from Chapters 1–3, you should be able to:

- compute Fourier coefficients and Fourier series for periodic functions (any period)
- understand the statement of the convergence theorem for Fourier series and apply it: calculate certain infinite series by evaluating a Fourier series at specific arguments
- recognize the distinction between a general Fourier series and a Fourier sine or cosine series; compute even and odd extensions of functions defined over a half-period and the corresponding Fourier sine or cosine series
- find formal series solutions to ODE’s with boundary conditions via Fourier analysis; recognize the presence or absence of resonance
- find formal series solutions to the classical PDE’s: the heat equation, the wave equation, Laplace’s equation via separation of variables and Fourier analysis. You should be able to reproduce the argument to derive the series solutions for these equations (as on Quiz #6).

Use of a calculator will be allowed on the exam. Graphing calculators are allowed, but not calculators which perform symbolic manipulation.