

Review for Exam 3
MATH 333
Fall 2009

This exam will cover 7.1-7.5, 8.1 and Appendix II, including contents covered in class 10/20-11/16. You also will have to be able to set-up initial value problems for spring-mass systems and *RLC*-circuits, which is discussed in the book in 5.1. All systems and matrices will have size at most 3.

1. Find Laplace transforms and inverse Laplace transforms using the methods from 7.1-7.5 and the Table of Laplace Transforms (back cover of the book). This includes partial fraction decomposition and calculation of convolution integrals.
2. Solve Initial Value Problems for input functions, which are polynomial, exponential, trigonometric, step-functions, periodic functions, Dirac Delta-functions (7.1-7.5).
3. Set up the initial value problem for a spring-mass system (undamped, damped, forced motions), and solve the resulting initial value problem using the Laplace transform (3.1 and 7.1-7.5).
4. Solve integrodifferential equations using the Laplace transform and the convolution theorem (7.4).
5. Write systems of differential equations in matrix form and vice versa (8.1).
6. Rewrite n -th order linear differential equations (and initial value problems) as first order linear systems (initial value problems) (class).
7. Check solution and linear dependence/independence of a given set of functions and a system of differential equations. Calculate corresponding Wronskians using determinants and their rules (8.1, Appendix II and class)
8. Find eigenvalues and eigenvectors of a given matrix (Appendix II).
9. Solve systems of linear equations using Gauss and Gauss-Jordan elimination (Appendix II).
10. Find inverses of matrices using Theorems II.2 and II.3 (Appendix II)

No calculators or any other tools are allowed on this test

Except: You can bring the copy of the two back cover pages *Table of Laplace transforms* for the exam, which have been distributed on Monday 11/16. There will be distributed copies of the two front cover pages before the test. Please keep all those copies for the final exam.

There will be **five** problems on the test. This gives you an average of 10 minutes per problem.