

Summary of the Final Exam

The Final Exam must be taken

Tuesday April 30 or **Wednesday May 1** or **Thursday May 2**

The format: 150 minutes, 135 points, no book, no notes, no calculator. It is just like a Midterm Exam, but 50% longer. There is a cover sheet, seven pages of actual exam, and finally three pages of tables and blank space.

The Final Exam is comprehensive over the whole course. Here is a detailed summary of what is on the actual Exam.

- page 1: A constant-coefficient 2nd-order ODE; solve by §4.3 methods. Then a §2.2 separation of variables 1st-order ODE problem.
- page 2: A three-part problem based on the ideas in §2.1, with a supplied direction field. The third part asks for a sketch of two steps of the Euler method (§2.6).
- page 3: First is an initial value problem for a linear, 1st-order ODE; solve by §2.3 methods. Second is a problem requiring that you know the definition of the Laplace transform (from §7.1; the definition is *not* in a Table) and requiring that you know how to do integration-by-parts.
- page 4: Use the Laplace transform to solve a 2nd-order ODE IVP. (Review partial fractions. Also practice using a table of Laplace transforms to find $y(t)$ once you have found $Y(s)$, that is, to do the inverse Laplace transform as in §7.2.)
- page 5: In the first problem, *verify* that a given formula satisfies a certain 2nd-order ODE IVP; see the problems in §4.1. In the second problem, convert a scalar 2nd-order ODE to a 1st-order system; see §4.10 and the slides for §5.3. Also an Extra Credit problem about using ode45.
- page 6: A question like example 1 or 2 in §8.2 where, as promised in the §8.2 slides, I supply the eigenvalues and eigenvectors. Also an Extra Credit problem about the matrix exponential.
- page 7: A straightforward §6.2 computation of a power series solution of a 2nd-order ODE IVP. The second part is easy if you understand that you know the radius of convergence in advance of computing the series itself. (See the beginning of §6.2.)
- pages 8–9: Here are four tables you have seen before. The first three appeared on Midterm 2.
 - 1. *Brief Table of Integrals*
 - 2. Table of *Maclaurin Series* from page 239 of the textbook
 - 3. Table 4.4.1 of *Trial Particular Solutions* from §4.4 of the textbook
 - 4. *Table of Laplace Transforms*, as appeared on Quiz 9 and Quiz 10
- page 10: Blank space for your work (if needed).