Summary of Midterm Exam 2

Midterm Exam 2 must be taken

Tuesday April 2 or **Wednesday April 3** or **Thursday April 4**

The format is the same as on Midterm 1: 90 minutes, 100 points, no book, no notes, no calculator. There is a cover sheet and eight pages following that. The sections covered are 4.1, 4.2, 4.3, 4.10, 5.1, 5.3, 6.1, 6.3, 9.1, and 9.2, but see below for more detail.

I have not prepared a Sample Midterm Exam 2.

Instead, here is a detailed summary of what is on the actual Exam.

page 1: This page has an easy and standard 2nd-order ODE IVP. First you are asked to solve it by §4.3 methods, and then by power series (§6.2). The solution is the same; you can check your work.

page 2: First is a standard 4th-order ODE from §4.3, in a case where you can factor the auxiliary equation by hand; you are asked for the general solution. The second problem is an easy and standard general solution problem from §4.4.

page 3: This three-part problem is from §5.1. You are first asked to sketch solutions for the different cases of damping for a 2nd-order, free, damped mass-spring ODE. Then you are asked to convert the same mass-spring equation into a first-order system (see §4.10). Last is a question which is easy to answer if you understand the basic idea of resonance when there is a sinusoidal driving force (§5.1 and Mini-Project 4).

page 4: The first question asks you to do one step of the improved Euler method (§9.1); the values are chosen to make by-hand arithmetic easy. The second question is easy if you understand the idea in §6.2 about advance knowledge of the minimum radius of convergence of a power series solution of a linear ODE around an ordinary point.

page 5: The question on this page asks you to solve a 2nd-order, linear, *non*-constant-coefficient ODE by power series, at least as far as writing down the recurrence relation for the coefficients. This is a main-stream §6.2 calculation.

page 6: The Extra Credit problems on this page include the sketch-of-RK4 problem promised in the slides for §9.2, and a question testing whether you are able to use the energy method to solve a nonlinear, 2nd-order ODE (Mini-Project 3).

page 7: This page merely has three tables you have seen before:

  1. *Table 4.4.1 Trial Particular Solutions* from §4.4 of the textbook and the §4.4 slides.

  2. The table of *Maclaurin Series* from page 239 (§6.1) of the textbook and the §6.1 slides.

  3. The *Brief Table of Integrals* which appeared on Quiz #7.

page 8: This is blank space for your work if needed.