MTH 240-001 Final Exam Information

Our cumulative 100-point final exam will consist of ten 10-point problems. Three of those problems will be take-home problems, assigned on December 5 and due on December 11. The remaining seven exam problems will be in-class problems on December 11 during our last class meeting. In order to receive full credit for the problems, you must show all work or supply explanations that support your answer. The take-home problems must be worked individually. If you need to reschedule your final exam or take it in the testing center, please make arrangements as soon as possible. Any rescheduled exams must be taken in the testing center (or in class during another of your instructor's final exams), and they must be completed on or before Thursday, December 11.

The final exam will cover the objectives listed below. Focus your studying on these skills.

Skills list for the in-class portion

1. Use initial value problem existence and uniqueness theorems. (Section 1.3)
2. Use Euler's method to approximate the solution of an initial value problem. (Chap 6)
3. Solve 1st-order separable equations. (Section 1.4)
4. Solve application problems involving separable equations, especially those involving exponential growth/decay and Newton's law of cooling. (Section 1.4)
5. Solve 1st-order linear equations. (Section 1.5)
6. Solve exact differential equations. (Section 1.6)
7. Solve constant-coefficient, homogeneous, linear ODE's. (Sections 2.1-2.3)
8. Solve 2nd-order, homogeneous, Cauchy-Euler equations. (Sections 2.1-2.3)
9. Use the method of undetermined coefficients to solve 2nd-order, linear, constant-coefficient, nonhomogeneous equations. (Section 2.5)
10. Find the equation of motion for a mass in a free, damped or undamped, mass-spring system. Write your solution in terms of a single sine or cosine (with a phase shift). (Section 2.4)
11. Use a power series centered at an ordinary point to solve a 1st or 2nd-order ODE. (Sections 3.1-3.2)
12. Use Laplace transform methods to solve initial value problems. (Sections 4.2-4.3)
13. Use Laplace transform methods to solve equations whose coefficients are not constants. (Section 4.4)

Skills list for the take-home portion

1. Solve application problems involving linear equations, especially those involving mixing. (Section 1.5)
2. Use basic substitutions to solve differential equations, including Bernoulli equations, homogeneous equations, and 2nd-order equations reducible to 1st order. (Section 1.6)
3. Solve 2nd-order, constant-coefficient, homogeneous, linear ODE's. (Sections 2.1-2.3)
4. Use the method of undetermined coefficients to solve 2nd-order, linear, constant-coefficient, nonhomogeneous equations. (Section 2.5)
5. Use variation of parameters to solve 2nd-order, linear, nonhomogeneous equations. (Section 2.5)
6. Use a power series centered at an ordinary point to solve a 1st or 2nd-order ODE. (Sections 3.1-3.2)

7. Use Laplace transform methods to solve initial value problems. (Sections 4.2-4.3)
8. Use properties of Laplace transforms to find transforms and inverse transforms. (Section 4.4)
9. Use Laplace transform methods to solve equations whose coefficients are not constants. (Section 4.4)
10. Determine the Fourier series of a function of period $2L$. (Section 8.2)
11. Determine the convergence properties of a Fourier series. (Section 8.2)
12. Determine the Fourier sine or cosine series of a function. (Section 8.3)
13. Use separation of variables to solve the heat equation with Dirichlet or Neumann boundary conditions. (Section 8.5)