MTH 240-001 Final Exam Information

The 100-point final exam will be made up of two parts: a 40-point take-home portion and a 60-point in-class portion. The take-home portion will be assigned Friday, May 3, and it will be due Thursday, May 9. Ten points per day will be deducted for late submissions. The in-class portion is scheduled for our last day of class (Thursday, May 9).

Final exam problems will be chosen from the list of topics below.

Skills list for the in-class portion

1. Solve 1st-order separable equations. (Section 1.4)
2. Solve 1st-order linear equations. (Section 1.5)
3. Solve exact differential equations. (Section 1.6)
4. Know and apply existence and uniqueness theorems for initial value problems associated with general linear ODE's. (Sections 2.1-2.3)
5. Solve constant-coefficient, homogeneous, linear ODE's. (Sections 2.1-2.3)
6. Use the method of undetermined coefficients to solve 2nd-order, linear, constant-coefficient, nonhomogeneous equations. (Section 2.5)
7. Find the equation of motion for a mass in a free, damped or undamped, mass-spring system. (Section 2.4)
8. Use a power series centered at an ordinary point to solve a 1st or 2nd-order ODE. (Sections 3.1-3.2)
9. Define the Laplace transform of a function, and use the definition to determine a transform. (Section 4.1)
10. Use a table to determine the Laplace transform of a function. (Section 4.1)
11. Use the linearity property of the Laplace transform. (Section 4.1)
12. Use partial fractions to determine inverse Laplace transforms. (Section 4.3)
13. Use a table to determine the inverse Laplace transform of a function. (Section 4.1)
14. Use Laplace transform methods to solve initial value problems. (Sections 4.2-4.3)

Skills list for the take-home portion

1. Use initial value problem existence and uniqueness theorems. (Section 1.3)
2. Solve 1st-order separable equations. (Section 1.4)
3. Solve application problems involving separable equations, especially those involving exponential growth/decay and Newton's law of cooling. (Section 1.4)
4. Solve 1st-order linear equations. (Section 1.5)
5. Solve application problems involving linear equations, especially those involving mixing. (Section 1.5)
6. Use basic substitutions to solve differential equations, including Bernoulli equations, homogeneous equations, and 2nd-order equations reducible to 1st order. (Section 1.6)
7. Solve exact differential equations. (Section 1.6)
8. Know and apply existence and uniqueness theorems for initial value problems associated with general linear ODE's. (Sections 2.1-2.3)
9. Solve 2nd-order, constant-coefficient, homogeneous, linear ODE's. (Sections 2.1-2.3)
10. Find the equation of motion for a mass in a free, damped or undamped, mass-spring system. (Section 2.4)

11. Use the method of undetermined coefficients to solve 2nd-order, linear, constant-coefficient, nonhomogeneous equations. (Section 2.5)
12. Use variation of parameters to solve 2nd-order, linear, nonhomogeneous equations. (Section 2.5)
13. Use a power series centered at an ordinary point to solve a 1st or 2nd-order ODE. (Sections 3.1-3.2)
14. Define the Laplace transform of a function, and use the definition to determine a transform. (Section 4.1)
15. Use a table to determine the Laplace transform of a function. (Section 4.1)
16. Use the linearity property of the Laplace transform. (Section 4.1)
17. Use a table to determine the inverse Laplace transform of a function. (Section 4.1)
18. Use Laplace transform methods to solve initial value problems. (Sections 4.2-4.3)
19. Use properties of Laplace transforms to find transforms and inverse transforms. (Section 4.4)
20. Use Laplace transform methods to solve equations whose coefficients are not constants. (Section 4.4)
21. Determine the Fourier series of a function of period $2L$. (Section 8.2)
22. Determine the convergence properties of a Fourier series. (Section 8.2)
23. Determine the Fourier sine or cosine series of a function. (Section 8.3)
24. Use separation of variables to solve the heat equation with Dirichlet or Neumann boundary conditions. (Section 8.5)