The exam will cover Euler's method, the improved Euler's method, and all material covered from Chapter 4 concerning second-order differential equations.

Here are some ideas of things you should be able to do on the exam. Not all these topics will be on the exam. If a topic from the covered material isn't here, that doesn't mean it won't be on the exam.

- Be able to do simple computations implementing Euler's and the improved Euler's method.
- Can you graphically show what the steps of using Euler's method and improved Euler's method are?
- Know the relationship between error and step size for these numerical methods.
- How do you solve second-order linear constant-coefficient homogeneous equations?
- Understand the principle of superposition in its several forms. How is it useful when using the method of undetermined coefficients?
- Know how to use the method of undetermined coefficients.
- What's the general strategy for solving

  $$y'' + P(t)y' + Q(t)y = R(t)?$$

  Be able to explain it in terms of particular solutions and solutions of the associated homogeneous equation.
- What's a Wronskian? What's it good for?
- Be able to solve initial value problems for second order, linear equations once a general solution has been obtained.
- Know how to use the method of variation of parameters to find a particular solution of a non-homogeneous differential equation.
- Know how to use the method of reduction of order to find one solution of a homogeneous equation given that you know another.
- Know the difference between underdamped, overdamped, and critically damped mass-spring systems.
- Given a mass-spring system, you should be able to compute the period or quasi-period of a solution.
- How do you convert between $c_1\cos(\omega t)+c_2\sin(\omega t)$ and $A\cos(\omega t-\phi)$ and $A\cos(\omega(t-t_*))$?