First Order Differential Equations
- Identify linear, nonlinear and separable equations, and understand order of an ODE.
- Understand solutions in algebraic, integral and graphical forms.
- Understand slope fields for first order equations and be able to plot and interpret simple examples.
- Understand and interpret plots of $dy/dx$ vs $y$ for autonomous equations.
- Solve 1st order linear differential equations using an integrating factor.
- Solve separable 1st order equations via separation of variables.
- Interpret solutions and link to properties of the original ODE.
- Applications, including: Newton’s law of cooling, dilutions, evaporation problems, population growth, logistic equation, radioactivity, etc. Similar to HW1.
- Matlab/Octave as covered on HW2.

Simple Systems of Differential Equations
- Solve simple 2x2 and 3x3 systems using eigenvalue-eigenvector method (distinct real eigenvalue cases only for this quiz).
- Interpret solutions and link to properties of the original system.

Text: The material listed above is mostly described in the text (Lebl). Some topics were emphasized more or less in class, so you should also refer to class notes and the kinds of problems from HW and WebWork.
- Chapter 1: 1.1-1.4. Part 1.2.2 (Existence and Uniqueness) is not needed for this test.
- Chapter 3: 3.1 (basic ideas), 3.2 (as needed), 3.4 (except 3.4.3), 3.5.

Practice problems: Material similar to assignments and web work is fair game for the midterm. MAKE SURE you know how to do those problems. Below are additional problems from the text for you to practice with. Solutions will not be provided - but some of the answers are at the back of the book.
- Section 1.1: All problems are OK. Try 101-105 for practise.
- Section 1.2: Try 1-3, 101-104 for practise.
- Section 1.3: All problems are OK. Try 101-105 for practise.
- Section 1.4: All problems are OK. Try 101-104 for practise.
- Section 3.1: None of these problems are relevant.
- Section 3.2: Review of linear algebra, as needed.
- Section 3.4: Good practise problems.
- Section 3.5: Do 101.