Exam #1 objectives

For Exam #1, a well-prepared student should be able to

- construct a slope field for a first-order differential equation
- use a slope field to describe typical solutions for a first-order differential equation
- distinguish between the set of all solutions for a first-order differential equation and a specific solution that satisfies a given initial condition
- find a specific solution for a given initial condition given the set of all solutions to a differential equation
- state the Existence-Uniqueness Theorem and use this theorem to provide information on qualitative features of first-order differential equations
- find and classify equilbrium points for an autonomous first-order differential equation
- construct a phase line for an autonomous first-order differential equation
- use a phase line to deduce qualitative features of solutions to an autonomous first-order differential equation
- construct a bifurcation diagram for an autonomous first-order differential equation that involves a parameter
- use separation of variables to find solutions for a first-order differential equation
- describe the algebraic structure of solutions to a linear first-order differential equation
- use "judicious guessing" to find the general solution for a linear first-order differential equation with certain types of nonhomogeneous terms
- find and use an integrating factor to find the general solution for a linear first-order differential equation
- use Euler's method to find an approximate solution for a first-order differential equation with initial condition
- understand the general connection between step size and accuracy in numerical approximation of solutions
- build, interpret, and analyze simple differential equation mdifferential equationls for real-world phenomema