Summary:

- Review for Midterm I

- Chapter 2
  - Autonomous systems
  - Numerical methods
  (Moved to Lecture 9)

Review for Midterm I

2. Diff Eq and Real World Problems

You should know how to write differential equations from realistic problems. See Lecture 1 and HW 1.

3. Formal Definitions

You should know the definition of:
- Diff Eqn, order of diff Eqn
- Solution
- General and singular she's
You should be able to:

- recognize the order of a given diff eqn
- check whether a given function is a soln of a given eqn
- recognize general and singular soln's.

See Lecture 1 and HW 1.

4. Exact solutions:

You should be able to recognize and solve for all solutions of the following eqn's:

(i) Separable Eqn's
- see Lecture Notes 2 and HW 1

(ii) First order linear eqn's
- see Lecture Notes 4 and HW 3

(iii) Bernoulli Eqn
- see Lecture Notes 5 and HW 3
(iv) General substitution method
    - see Lecture Notes 5 and HW 3
(iv) Homogeneous Eqn
    - see Lecture Notes 5 and HW 4
(vi) Exact Equations
    - see Lecture Notes 6 and HW 4
(vii) Reducible second order Eqn's
    1° \[ F(x, y', y'') = 0 \]
    - see Lecture Notes 6 and HW 4
    2° \[ F(y, y', y'') = 0 \]
    - see Lecture Notes 7 and HW 4
    3° \[ y''' = f(y) \]
    - see Lecture Notes 7

5. Direction (Slope) Field

You should be able to:
- plot by hand such a direction field for a given equation
- use the direction field to approximate some
- recognize certain characteristics of solutions from the direction field.
like: periodicity, dependence on initial data (stability), stationary (constant) solutions.

See Lecture Notes 2 (at the end), 3, and 4 (at the beginning) and HW 2 = Project 1

6. Theorem of Existence and Uniqueness

You should know:
- its statement
- how to check whether it is applicable and what is the conclusion
- how to use it to verify whether you found all solutions of a given system.

See Lecture 4 and HW 3.

End of Review for Midterm I