Review Sheet for 1st exam, which is Monday 9/29

Problem sessions:
Thursday 4-5:30 LCB 323 (not here!)
Saturday 10-11:30 JW 335 (here!)

Chapter 1: Methods to solve certain 1st order DE's
Integration: for dy/dx = f(x)
- position, velocity, acceleration, when acceleration is a function of $t$ alone.
- Separable DE's
- Growth & decay (exponential)
  - populations, radioactive decay, Newton's law of cooling (with constant ambient temp.)
  - drug elimination, rumor propagation, disease spread
  - NO TORRICELLI ON EXAM
- Linear 1st order DE's
- Mixing problems
- Slope fields and phase diagrams to understand qualitative behavior of solutions
  - without knowing formulas for solution.
  - How to draw these, especially for autonomous DE's.

Chapter 2: Applications in depth
- Population models: logistic, doomsday/extension, harvesting logistic;
  - Understand derivations, how to find solutions (by separating variables,)
  - how to plot slope fields & phase portraits, how to find equilibrium solutions and assess stability/unstability.
- Equilibrium solutions & stability for general 1st order autonomous DE's.
- Acceleration-velocity models, especially linear drag (force proportional to velocity).

Chapter 3: Linear systems and matrices
- Solving linear systems by creating the augmented matrix, using elementary row operations to get $REF$, deducing solution by back-solving.
- Geometric meaning of linear systems in 2 or 3 variables
- Matrix algebra: addition, scalar multiplication, matrix multiplication
- What algebra rules hold, and which one(s) don't.
- Matrix inverses
  - How to compute via row operations
  - How to solve linear systems with the inverse matrix, if the inverse exists.
- Determinants
  - How to compute with cofactors
  - How to compute with row operations
  - Cramer's rule
  - Adjoint formula for the inverse, esp. $2 \times 2$ & $3 \times 3$ cases.