Math 221

A checklist of topics covered

First order equations

- differential equations terminology, initial value problems (IVPs)
- existence/uniqueness theorem
- direction fields
- Euler's method
- separable equations
- linear first order equations, integrating factors
- applications
  - compartmental analysis
  - Newton's law of cooling
  - Newtonian mechanics

Second order equations

- differential operators
- existence/uniqueness theorem
- homogeneous solutions, fundamental solutions, particular solutions
- Wronskian
- linear equations with constant coefficients
- Cauchy-Euler equations
- reduction of order
- variation of parameters
- undetermined coefficients
- higher-order equations
- applications: spring-mass systems

Systems of equations

- elimination method
- autonomous systems, direction fields
- nullclines, equilibrium solutions
- phase portraits
- applications: multiple tank systems

Laplace transforms

- Laplace transform, linear operator
- inverse Laplace transform
- solving IVPs: partial fractions
- discontinuous external forces
- Dirac delta function, impulsive forces