

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