Outline of Math 373

1 Linear Programming
   A Variants of the linear programming problem
   B Examples of linear programming problems
   C Piecewise linear convex objective functions
   D Graphical representation and solution
   E Linear algebra background and notation
   F Algorithms and operation counts

2 The Geometry of Linear Programming
   A Polyhedra and convex sets
   B Extreme points, vertices, and basic feasible solutions
   C Polyhedra in standard form
   D Degeneracy
   E Existence of extreme points
   F Optimality of extreme points
   G Representation of bounded polyhedra
   H Projections of polyhedra: Fourier-Motzkin elimination

3 The Simplex Method
   A Optimality conditions
   B Development of the simplex method
   C Implementations of the simplex method
   D Anticycling: lexicography and Bland’s rule
   E Finding an initial basic feasible solution
   F Column geometry and the simplex method
   G Computational efficiency of the simplex method

4 Duality Theory
   A Motivation
   B The dual problem
   C The duality theorem
   D Optimal dual variables as marginal costs
   E Standard form problems and the dual simplex method
   F Farkas’ lemma and linear inequalities
   G From separating hyperplanes to duality
5 Sensitivity Analysis

A Local sensitivity analysis
B Global dependence on the right-hand side vector
C The set of all dual optimal solutions
D Global dependence on the cost vector
E Parametric programming

6 Evolutionary Game Theory