Test #2 — Outline

Algebra of the Simplex Method

- basic, nonbasic variables (x_B, x_N)
- express objective function, basic variables in terms of x_N
- transform original columns, premultiplying by B^{-1}
  - economic interpretation of $\alpha_k = B^{-1}a_k$
- reduced costs $z_k - c_k$ and optimality conditions
- algebraic representation of directions
  - unbounded objective function

Tableau Form

- bring all variables to left-hand side
- basic variables have associated identity columns
- B^{-1} is found in current tableau (slack columns)
- restatement of simplex method
  - entering, leaving variables
  - "pivot" operation (row operations)
- alternative optimal solutions
- degeneracy and cycling
- unbounded objective function
- obtaining an initial BFS
  - two-phase method, artificial variables
- unrestricted variables

Revised Simplex Method

- dual variables $\pi = c_B B^{-1}$
- find reduced costs of nonbasic x_k using $z_k - c_k = \pi a_k - c_k$
- determine leaving variable by ratios using β and α_k
- update B^{-1} using a pivot step
- π variables are reduced costs of slack variables
- can verify optimality of proposed solution directly (one step)
- second way of implementing RSM: solving linear equations

Bounded Variable Simplex Method

- nonbasic variables now set to upper/lower bound
- new optimality conditions (upper/lower bound)