Geometric Approach to
Linear Programming

Chapter 4, sections 4.1 and 4.2

Follow-up on Session #7

1) Suggested Homework Problems may be an inadequate number
   - Section 2.2 - Using Matrix Method, read all the applications problems #61-75, pp 86-87
   - Section 2.3 - m Equations with n variables, read all apps from #29-37, pages 96-97
   - Section 3.1 - Matrix Algebra - until comfy
   - Section 3.2 - Matrix Multiplication ditto
   - Section 3.3 - Inverse of Matrix - only 7 to do
   - Section 3.4 - Applications are interesting (to me at least) but are not tested
2) Quiz Questions from § 1.1 - 3.1
3) Next Exam will be chap. 1 to 5

Linear Programming with Two Variables

Coming Now
   - Systems of Linear Inequalities
   - Geometric Approach to Linear Programming Problems

Coming After That
   - Combining previous use of matrices to solving inequalities w/ linear programming approach
   - Using Excel to solve minimum / maximum problems
Systems of Linear Inequalities
- Can (already) graph lines – think of lines as boundaries
- Can then also graph inequalities
  - Graph the boundary line
  - Shade in the area that satisfies the inequality
  - Repeat for all areas in problem

Section 3.1
- Recall chapter 1 on pairs of lines
- Graph linear inequalities
- Graph system of linear inequalities
- Solve applied problems

Section 4.1
- See purple box on page 177
  - Graph the line
  - Select a test point
  - Check “satisfaction” of inequality with the test point
  - Shade the region to be included
- Examples page 190
  - #62 - Financial Planning
  - #64 - Home Mortgages
Section 4.2

- Identify a linear programming problem (page 192, green box)
- Theorem: Criteria / Conditions) for the Existence of a Solution (page 194, yellow box)
- Theorem: Fundamental Theorem of Linear Programming with Two Variables (page 195, yellow box)
- Steps for Solving a Linear Optimizing / Programming Problem (page 195, purple box)

Section 4.2 – see page 192

- Theorem: Conditions for a Solution with objective function in form of \( z = Ax + By \)
  - If Region R is bounded then z has both minimum and maximum
  - If R is unbounded, z has minimum
  - If R is empty, then no solution
- Theorem: Fundamental Theorem of Linear Programming with Two Variables = “Corner Point Theorem”

Section 4.2

- Steps of Solving a Linear Programming Problem – p 195
  - Write the objective function z
  - Determine all constraints, graph the set of feasible points
  - List all corner points
  - Determine value of z at all corners
  - Select the max or min value of z
- Example: Bus trip page 206 #8
For Exam #1 on 2 Oct 2013

- “Formula card” permitted
  - 3” x 5” one sided
  - Any piece of info, any size print
- No surprises
  - Multiple guess like quiz or CPA exam questions at chapter end
  - Straight work the numbers
  - Word problems
    - Fewer in #, but worth more points
    - Partial credit given, show all work
- Group review session?

Review by way of Group Quiz

- Self divide into groups of two to four
- Work problems collectively
- One paper per group to be submitted
- Same score for all

Other Notes for the Day

1. Read chapter 5 before next class, to understand the Simplex Method (technique)
2. Next: using Excel to solve linear programming problems in chapter 5 (bring laptop)
3.
4.
5.