SA305 – Linear Programming Spring 2013
Asst. Prof. Nelson Uhan

Exam 1 – Information

1 Information

- When: **Friday February 15** in class
- What: Lessons 1 – 15
- No outside materials allowed
- No calculators
- Review on Wednesday February 13 in class
- EI on Thursday February 14, 1900 – 2030, CH348

2 Review Problems

Note: make sure to review all the different types of modeling problems we've studied so far this semester.

Problem 1. Consider the following feasible region of a linear program:

$$\begin{aligned} x - 2y &\leq 4 \\ x - y &\geq -2 \\ x &\geq 0 \\ y &\geq 0 \end{aligned}$$

a. Graph the feasible region.
b. Give a *maximizing* objective function such that $(2, 0)$ and $(0, 0)$ are optimal in the feasible region above.
c. Give a *maximizing* objective function such that $(2, 2)$ is optimal in the feasible region above.
d. Add a constraint that makes the feasible region infeasible.

Problem 2. Dantzigbank is attempting to determine where its assets should be invested during the current year. At present, \$500,000 is available for investment in bonds, home loans, auto loans, and personal loans. The annual rate of return on each type of investment is known to be

Investment	Rate of return
Bonds	10%
Home loans	16%
Auto loans	13%
Personal loans	20%

To ensure that its portfolio is not too risky, Dantzigbank's investment manager has placed the following three restrictions on the bank's portfolio:

- The amount invested in personal loans cannot exceed the amount invested in bonds.
- The amount invested in home loans cannot exceed the amount invested in auto loans.

- No more than 25% of the total amount invested may be in personal loans.

The bank's objective is to maximize the annual return on its investment portfolio. Formulate a linear program that will enable Dantzigbank to meet this goal.

Problem 3. The Simplex Company produces 3 products: A, B, and C. These products can be sold in unlimited quantities at the following unit prices:

Product	A	B	C
Price	10	50	100

The production requirements are as follows. Producing one unit of product A requires 1 hour of labor. Producing one unit of product B requires 2 hours of labor plus 2 units of A. Producing one unit of product C requires 3 hours of labor plus 1 unit of B. In addition, any units of product A used to produce product B cannot be sold, and any units of product B used to produce product C cannot be sold. A total of 40 hours of labor are available. Formulate a linear program to maximize the company's revenues. You may assume that fractional solutions are acceptable.

Problem 4. The Fulkerson Company manufactures ski jackets. Their business is highly seasonal: next year, the expected demand in week t is d_t, for all $t \in \{1, \ldots, 52\}$. The company can produce K ski jackets per week, but inventories must be built up to meet larger demands at a holding cost of h per jacket per week. Fulkerson wants to meet demand while minimizing inventory cost. Formulate a linear program that determines an optimal production plan for next year.