

Exam 2 – Information

1 Information

- When: **Friday April 4** in class
- What: Lessons 16 – 28
- One 8.5 in \times 11 in sheet of handwritten notes allowed
- Calculators allowed (you will need to solve systems of equations quickly)
- Review on Wednesday April 2 in class
- EI on Thursday April 3, 1900 – 2000, CH348

2 Review Problems

- Exam from last year posted on course website

Problem 1. Suppose you are in the midst of performing the simplex method on the following canonical form LP:

$$\begin{aligned} \text{maximize} \quad & ax_1 + x_2 + bx_4 \\ \text{subject to} \quad & x_1 + x_2 + ?x_3 = 9 \\ & ?x_1 + x_2 + x_4 = 0 \\ & x_1 - 2x_2 + ?x_4 + x_5 = 0 \\ & x_1, x_2, x_3, x_4, x_5 \geq 0 \end{aligned}$$

The current BFS is $\mathbf{x}^t = (0, 0, 3, c, 1)$ and the current basis is $\mathcal{B}^t = \{x_3, x_4, x_5\}$. The simplex directions at this iteration are:

$$\mathbf{d}^{x_1} = (1, 0, d, 2, e) \quad \mathbf{d}^{x_2} = (0, 1, -1, f, g)$$

Note that some coefficients and values are missing (represented by question marks ?), and some coefficients and values are represented by the parameters a, b, c, d, e, f, g .

Give conditions (which may or may not be mathematically possible) on a, b, c, d, e, f, g such that

- the current BFS \mathbf{x}^t is degenerate.
- the current BFS \mathbf{x}^t is optimal.
- the LP is unbounded.
- x_2 becomes basic and x_4 becomes nonbasic at the next iteration.
- the step size from the current solution \mathbf{x}^t to the next solution \mathbf{x}^{t+1} is 0.