Exam 2 – Information

1   Information

- When: **Friday April 5** in class

- What: Lessons 16 – 28

- One 8.5 in × 11 in sheet of <u>handwritten</u> notes allowed

- Calculators allowed (you will need to solve systems of equations quickly)

- Review on Wednesday April 3 in class

- EI on Thursday April 4, 1900 – 2030, CH348

2   Review Problems

- Exam from last year posted to course website

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

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

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:

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

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

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