Problem Set 1C: Simplex and Pivoting

Help

The **due date** for this homework is **Mon 10 Nov 2014 3:00 PM CST**.

☐ **In accordance with the Coursera Honor Code, I (Kevin Zhu) certify that the answers here are my own work.**

Question 1

Consider the dictionary

$$\begin{array}{c|c|ll} x_3 & 2 & +3x_1 & -1x_2 \\ x_4 & 11 & & -1x_2 \\ x_5 & 3 & -1x_1 & +1x_2 \\ x_6 & 6 & -1x_1 & \\ \hline z & 0 & +1x_1 & +2x_2 \end{array}$$

Assume x_1, x_2 are original problem variables and $x_3, \ldots, x_6$ are slack variables. Which of the following standard form problems could have given rise to this dictionary?

○ $\begin{array}{ll} \max & x_1 \\ \text{s.t.} & x_2 \leq 11 \\ & x_1 - x_2 \leq 3 \\ & x_1 \leq 6 \\ & x_1, x_2 \geq 0 \end{array}$

○ $\begin{array}{ll} \min & x_1 + 2x_2 \\ \text{s.t.} & -3x_1 + x_2 \leq 2 \\ & x_2 \leq 11 \\ & x_1 - x_2 \leq 3 \\ & x_1 \leq 6 \\ & x_1, x_2 \geq 0 \end{array}$

○ $\begin{array}{ll} \max & x_1 + 2x_2 \\ \text{s.t.} & -3x_1 + x_2 \leq 2 \\ & x_2 \leq 11 \\ & x_1 - x_2 \leq 3 \\ & x_1 \leq 6 \\ & x_1, x_2 \geq 0 \end{array}$

- $\begin{aligned} \max \quad & -x_1 - 2x_2 \\ \text{s.t.} \quad & 3x_1 - x_2 \leq 2 \\ & -x_2 \leq 11 \\ & -x_1 + x_2 \leq 3 \\ & -x_1 \leq 6 \\ & x_1, x_2 \geq 0 \end{aligned}$
- $\begin{aligned} \max \quad & x_1 + 2x_2 \\ \text{s.t.} \quad & 3x_1 - x_2 \leq 2 \\ & -x_2 \leq 11 \\ & -x_1 + x_2 \leq 3 \\ & -x_1 \leq 6 \\ & x_1, x_2 \geq 0 \end{aligned}$

Question 2

Consider the dictionary

$$\begin{array}{c|ccc} x_3 & 2 & +3x_1 & -1x_2 \\ x_4 & 11 & & -1x_2 \\ x_5 & 3 & -1x_1 & +1x_2 \\ x_6 & 6 & -1x_1 & \\ \hline z & 0 & +1x_1 & +2x_2 \end{array}$$

What are all the correct choices entering variables? Choose all the variables that can enter and make sure that wrong options are left unselected.

- x_2
- x_1
- x_3
- x_5
- x_4

Question 3

Consider the dictionary

x_3	2	$+3x_1$	$-1x_2$
x_4	11		$-1x_2$
x_5	3	$-1x_1$	$+1x_2$
x_6	6	$-1x_1$	
z	0	$+1x_1$	$+2x_2$

If x_2 enters then select all possible correct choices for the leaving variable. Make sure correct options are all selected and wrong options are not.

- [ ] x_1
- [ ] x_3
- [ ] x_6
- [ ] x_5
- [ ] x_4

Question 4

Consider the dictionary

x_3	2	$+3x_1$	$-1x_2$
x_4	11		$-1x_2$
x_5	3	$-1x_1$	$+1x_2$
x_6	6	$-1x_1$	
z	0	$+1x_1$	$+2x_2$

If x_1 enters and x_5 leaves, then select appropriate values for the missing data in the subsequent dictionary:

x_3	b_3	$-3\ x_5$	$+2x_2$
x_4	b_4		$-1x_2$
x_1	b_1	$-1x_5$	$+1x_2$
x_6	b_6	$+1x_5$	$-1x_2$
z	z_1	$-1x_5$	$+3x_2$

Make sure that all right options are selected and no wrong options are.

- [ ] $b_3 = 11$
- [ ] $z_1 = 0$
- [ ] $b_6 = 3$

- [ ] $b_4 = 11$
- [ ] $b_6 = 1$
- [ ] $b_1 = 3$
- [ ] $b_3 = 2$
- [ ] $b_1 = -1$
- [ ] $z_1 = 3$

- [ ] **In accordance with the Coursera Honor Code, I (Kevin Zhu) certify that the answers here are my own work.**

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