General Mathematics and CPS II

Exercise 19

April 22, 2015

1. Use the simplex method to solve the following linear programming problem. Maximize $z=2\,x_1+x_2$

subject to

$$3 x_1 + x_2 \le 6$$
,
 $x_1 - x_2 \le 2$,
 $x_2 \le 3$,
 $x \ge 0$.

2. Suppose each of the following tableaus occurs in the course of performing the simplex algorithm on a linear programming problem.

(a)	x_1	x_2	x_3	x_4	
	-1	1	0	0	4
	-2	0	-2	1	1
	5	0	3	0	5
(b)	x_1	x_2	x_3	x_4	
	0	-1	1	-1	4
	1	1	0	0	1
	0	1	0	-2	5
	x_1	x_2	x_3	x_4	
(a)	$\frac{x_1}{2}$	$\frac{x_2}{-1}$	$\begin{array}{c} x_3 \\ 0 \end{array}$	$\begin{array}{c} x_4 \\ 1 \end{array}$	0
(c)	$\begin{array}{c} x_1 \\ \hline 2 \\ 1 \end{array}$	$\begin{array}{c} x_2 \\ \hline -1 \\ 1 \end{array}$	$\begin{array}{c} x_3 \\ 0 \\ 1 \end{array}$	$\begin{array}{c} x_4 \\ 1 \\ 0 \end{array}$	0 1
(c)	$\begin{array}{r} x_1 \\ \hline 2 \\ \hline 1 \\ \hline 2 \\ \hline \end{array}$	$\begin{array}{c} x_2 \\ -1 \\ 1 \\ 1 \end{array}$		$\begin{array}{c} x_4 \\ 1 \\ 0 \\ 0 \\ \end{array}$	0 1 10
(c)	$\begin{array}{c} x_1 \\ \hline 2 \\ 1 \\ \hline 2 \\ x_1 \end{array}$	$\begin{array}{c} x_2 \\ -1 \\ 1 \\ 1 \\ x_2 \end{array}$	$egin{array}{c} x_3 \\ 0 \\ 1 \\ 0 \\ x_3 \end{array}$	$\begin{array}{c c} x_4 \\ 1 \\ 0 \\ 0 \\ x_4 \end{array}$	0 1 10
(c)	$\begin{array}{r} x_1 \\ \hline 2 \\ \hline 1 \\ \hline 2 \\ \hline x_1 \\ \hline 2 \\ \hline 2 \\ \end{array}$			$\begin{array}{c c} x_4 \\ 1 \\ 0 \\ 0 \\ x_4 \\ 1 \\ \end{array}$	0 1 10 3
(c) (d)		$\begin{array}{c} x_2 \\ -1 \\ 1 \\ 1 \\ x_2 \\ 1 \\ 0 \end{array}$	$egin{array}{c} x_3 \\ 0 \\ 1 \\ 0 \\ x_3 \\ 0 \\ 1 \end{array}$	$\begin{array}{c} x_4 \\ 1 \\ 0 \\ 0 \\ x_4 \\ 1 \\ 4 \end{array}$	0 1 10 3 3

State, for each case, whether

- The problem has a finite solution;
- The solution is unique;
- The solution is degenerate (i.e., one of the basic variables is zero).