PRINCE SULTAN UNIVERSITY

MATH 101 FINITE MATHS

MAJOR 2 EXAM 10TH DEC. 2011

Time Allowed: 80 minutes

Name: _____

I.D.: _____

Section: _____

1. Answer all questions.
2. This exam consists of 5 pages including this cover sheet.
3. There are 6 questions. CHECK YOU HAVE ALL THE QUESTIONS.
4. You can use a calculator, NOT a mobile phone.
5. Show all working out in the space provided. If you use the back of a page indicate this on the front.

Question No.	Max. Points	Points Scored
1,2	16	
3,4	14	
5	12	
6	12	
TOTAL	54	
TOTAL	100	

1) [8 points] Graph the solution set:

$$\begin{cases} 3x+6y \geq 12 \\ 7x+10y \leq 70 \\ 9x-6y \geq -18 \\ x \leq 7 \end{cases}$$

2) [8 points] A computer company manufactures two kinds of computers – a desktop and a laptop model. In the production process each desktop requires 6 hours of manufacture and 6 hours of assembly, and each laptop needs 3 hours of manufacture and 8 hours of assembly. The company has six manufacturing workers and twelve assembly workers each of whom works at most 40 hours per week. Each desktop brings a profit of $30 and each laptop a profit of $35. Assuming that every computer made will be sold, how many of each should be made to maximize the profit?

3) [6 points] For each of the following, determine whether each tableau
i) is the final tableau (if it is, give the solution)
ii) requires further pivoting (if so, circle the pivot element)
iii) indicates no solution
Write a brief sentence to explain your choice.

a)

BV	P	x_1	x_2	s_1	s_2	RHS
x_1	0	1	0	0	4	24
s_2	0	0	−2	1	4	36
P	1	0	−10	0	4	20

b)

BV	P	x_1	x_2	s_1	s_2	RHS
x_1	0	1	0	2	1	40
x_2	0	0	1	−1	2	20
P	1	0	0	1	2	140

c)

BV	P	x_1	x_2	s_1	s_2	RHS
s_1	0	1	0	1	1	20
x_2	0	$\frac{1}{2}$	1	0	1	30
P	1	−1	0	0	1	120

4) [8 points] Use the simplex method to solve the following problem, if possible:

Maximize $P = 2x_1 + x_2 + x_3$ subject to the constraints

$$-2x_1 + x_2 - 2x_3 \le 4$$
$$x_1 - 2x_2 + x_3 \le 2$$
$$x_1 \ge 0 \quad x_2 \ge 0 \quad x_3 \ge 0$$

5) [12 points] Minimize $C = 3x_1 + 4x_2$ using the Duality Principle,

subject to the constraints

$$x_1 + x_2 \geq 3$$
$$2x_1 + x_2 \geq 4$$
$$x_1 \geq 0 \quad x_2 \geq 0$$

6) [12 points] Solve the following maximum problem:

Maximize $P = 5x_1 + 2x_2$ subject to the constraints

$$x_1 + x_2 \geq 11$$
$$2x_1 + 3x_2 \geq 24$$
$$x_1 + 3x_2 \leq 18$$
$$x_1 \geq 0 \qquad x_2 \geq 0$$