Math 125 Quiz 5 Spring 2017 Name: _____

TA: Reynolds Trifunovski Zheng **Discussion Time** 8 9 10 11

1. A farmer is deciding how much of his land to plant in each of two crops: wheat and soybeans. He wants to plant at most 500 acres in total. Each acre of wheat requires \$30 in chemical cost. Each acre of soybeans requires \$40 in chemical cost. He can spend at most \$18,000 on chemicals. Each acre of wheat requires 2 gallons of fuel. Each acre of soybeans requires 4 gallons of fuel. He can use at most 800 gallons of fuel. Each acre of wheat yields a profit of \$100. Each acre of soybeans yields a profit of \$150. His goal is to maximize profit.

   (a) (2 pts) Let x be the number of acres in wheat and y the number of acres in soybeans. Write all the constraints and the objective function corresponding to the above scenario.

$$\begin{cases} x + y \leq 500 \\ 30x + 40y \leq 18000 \\ 2x + 4y \leq 800 \\ x \geq 0, y \geq 0 \end{cases}$$

maximize $100x + 150y$

   (b) (4 pts) Convert all of the above inequalites (except the non-negativity ones) and the objective function into equalites using slack variables.

$$x + y + u = 500$$
$$30x + 40y + v = 18000$$
$$2x + 4y + w = 800$$
$$-100x - 150y + R = 0$$

   (c) (4 pts) Construct the corresponding simplex tableau. Label the tableau appropriately. Do not PIVOT, just give and lable the tableau.

x	y	u	v	w	R	
1	1	1	0	0	0	500
30	40	0	1	0	0	18000
2	4	0	0	1	0	800
-100	-150	0	0	0	1	0

2. A linear programming problem yields the following simplex tableau:

x	y	z	u	v	w	M	
0	3	1	1	2	0	0	36
1	1	2	0	1	0	0	55
0	8	1	0	3	1	0	64
0	−6	−2	0	−4	0	1	10

36/3 = 12
55
64/8 = 8

(a) (2 pts) Find the particular solution corresponding to the simplex tableau.

$x = 55$
$y = 0$
$z = 0$
$M = 10$

(b) (1 pt) Identify the column to pivot on next. Why did you pick this column?

col 2. −6 is most negative in bottom row.

(c) (1 pt) Identify the element to pivot on next. Why did you pick this element?

8 in row 3. $\frac{64}{8}$ is smallest ratio.

(d) (2 pts) Pivot on this element with your calculator and write the new simplex tableau.

0	0	5/8	1	7/8	−3/8	0	12
1	0	15/8	0	5/8	−1/8	0	47
0	1	1/8	0	3/8	1/8	0	8
0	0	−5/4	0	−1/4	3/4	1	58

(e) (2 pts) Find the particular solution corresponding to this simplex tableau.

$x = 47$
$y = 8$
$z = 0$
$M = 58$

(f) (1 pt) Does this solution offer an optimal solution? Yes or (No.)

(g) (1 pt) How did you determine your answer to question (f) ?

negatives in last row