

# Math 30210 — Introduction to Operations Research

Quiz 6 – Wednesday October 17, 2007

NAME: \_\_\_\_\_

**Instructions:** This is a closed-book quiz. Please do not use any notes.

A certain linear programming problem is of the form: Maximize  $r_1x + r_2y$  subject to  $a_1x + b_1y \leq c_1$  and  $a_2x + b_2y \leq c_2$  with  $x, y \geq 0$  (and  $c_1, c_2 \geq 0$ ).

The optimal simplex tableau for the problem is shown below:

Basic	$z$	$x$	$y$	$s_1$	$s_2$	Soln.
Max	1	0	0	4	5	45
$y$	0	0	1	2	-1	2
$x$	0	1	0	-1	3	20

Since the two basic variables at the optimum are  $x$  and  $y$ , we see that the optimum is reached at the intersection of the two constraints.

1. Suppose that  $c_1$  is changed to  $c_1 + d_1$ , and  $c_2$  is changed to  $c_2 + d_2$ . What simultaneous conditions must be satisfied by  $d_1$  and  $d_2$  to ensure that the optimum is still the intersection of the two constraints?
2. Use the first part to show that if  $c_1$  is changed to  $c_1 + 2$ , and  $c_2$  is changed to  $c_2 + 5$ , then the optimum is still the intersection of the two constraints.
3. If  $c_1$  is changed to  $c_1 + 2$ , and  $c_2$  is changed to  $c_2 + 5$ , what does the optimum objective value change to?