

- Marks are shown in brackets [].
- On all questions you are expected to EXPLAIN YOUR WORKING and SHOW ALL CALCULATIONS unless explicitly stated otherwise.

Name: _____ Student ID: _____ Time: 25 Minutes

1. [20] Consider the following problem.

$$\begin{aligned} &\text{Minimize} && W = 5y_1 + 4y_2, \\ &\text{subject to} && \\ & && 4y_1 + 3y_2 \geq 4 \\ & && 2y_1 + y_2 \geq 3 \\ & && y_1 + 2y_2 \geq 1 \\ & && y_1 + y_2 \geq 2 \\ &\text{and} && \\ & && y_1 \geq 0, \quad y_2 \geq 0. \end{aligned}$$

Because this primal problem has more functional constraints than variables, suppose that the Simplex method has been applied directly to its dual problem. If we let x_5 and x_6 denote the slack variables for this dual problem, the resulting final simplex tableau is:

Basic Variable	Eq.	Coefficient of:						Right Side	
		Z	x_1	x_2	x_3	x_4	x_5		x_6
Z	(0)	1	3	0	2	0	1	1	9
x_2	(1)	0	1	1	-1	0	1	-1	1
x_4	(2)	0	2	0	3	1	-1	2	3

For each of the following independent changes in the original primal model, you now are to conduct sensitivity analysis by directly investigating the effect on the dual problem and then inferring the complementary effect on the primal problem. For each change, apply the procedure for sensitivity analysis to the dual problem (do not reoptimize), and then give your conclusions as to whether the current basic solution for the primal problem still is feasible and whether it still is optimal.

- Change the objective function to $W = 3y_1 + 5y_2$.
- Change the first constraint to $2y_1 + 4y_2 \geq 7$.