§6.7 (PART 1): THE DUALITY THEOREM

1.] Prove: If the primal is unbounded, then the dual problem is infeasible.

2.] For the following LP,

$$\text{Maximize:} \quad z = -x_1 + 5x_2$$

$$\begin{aligned} \text{Subject to:} \quad x_1 + 2x_2 &\leq 0.5 \\ -x_1 + 3x_2 &\leq 0.5 \\ x_1, x_2 &\geq 0 \end{aligned}$$

the Row 0 of the optimal tableau is

Row	Basic	z	x_1	x_2	s_1	s_2	RHS
0	z	1	0	0	0.4	1.4	??

What is the optimal z-value of the given LP?

3.] Consider the following LP:

$$
\begin{aligned}
\text{Maximize:} \quad & z = -2x_1 - x_2 + x_3 \\
\text{Subject to:} \quad & x_1 + x_2 + x_3 \leq 3 \\
& x_2 + x_3 \geq 2 \\
& x_1 + x_3 = 1 \\
& x_1, x_2, x_3 \geq 0
\end{aligned}
$$

The Row 0 of the optimal tableau is

Row	Basic	z	x_1	x_2	x_3	s_1	e_2	a_2	a_3	RHS
0	z	1	4	0	0	0	1	$(M-1)$	$(M+2)$	0

What is the optimal solution to the dual LP? Verify that the optimal objective value function for the dual is the same as the primal.