MAT168 HW4

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(1)

Iteration 1

Draw out original problem

l			$\boxed{0}$		$\boxed{0}$		
	u		6		8		
		ζ $=$	$-x_1$	$+$	x_2	$=$	0
$-\infty$	5	w_1 $=$	$-x_1$	$+$	x_2	$=$	0
$-\infty$	9	w_2 $=$	x_1	$-$	$2x_2$	$=$	0

Determine entering variable

x_2 has positive coefficient and is at lower bound, x_2 enters.

Determine leaving variable

As $x_2 \to 8$:
$w_1 \to -\infty \le x_2 \le 5 \to x_2 = 5$
$w_2 \to -\infty \le -2x_2 \le 9 \to x_2 = \infty$

w_1 leaves.

Iteration 2

Rewriting equation

l			$-\infty$		0		
u			$\boxed{5}$		$\boxed{8}$		
		ζ	$=$	w_1	$+$	$0x_2$	$=$	5
0	6	x_1	$=$	$-w_1$	$+$	x_2	$=$	3
$-\infty$	9	w_2	$=$	$-w_1$	$-$	x_2	$=$	-13

Optimal

This is optimal since w_1 has positive coefficient and upper bound is chosen, and x_2 has coefficient of 0.

(2)

Dual

The piecewise linear formation of the dual is:

$$\begin{aligned}
\text{minimize} \quad & 5y_1^+ + 9y_2^+ + 0z_1^+ + 0z_2^+ \\
& \infty y_1^- + \infty y_2^- + 6z_1^- + 8z_2^- \\
\text{subject to} \quad & -y_1 + y_2 - z_1 = 0 \\
& y_1 - 2y_2 - z_2 = 0
\end{aligned}$$

Complimentary Slackness

$w_1 = 5 \rightarrow y_1 = 0$
$x_2 = 8 \rightarrow z_2 = 0$

Using complimentary slackness:

$$\begin{aligned}
\text{minimize} \quad & y_2^+ + 0z_1^+ \\
& \infty y_2^- + 6z_1^- \\
\text{subject to} \quad & y_2 - z_1 = 0 \\
& -2y_2 = 0
\end{aligned}$$

Solve

$-2y_2 = 0 \rightarrow y_2 = 0$
$y_2 z_1 = 0$

Collaboration

Academic Integrity

On my personal integrity as a student and member of the UCD community, I have not given, nor received any unauthorized assistance on this assignment.

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