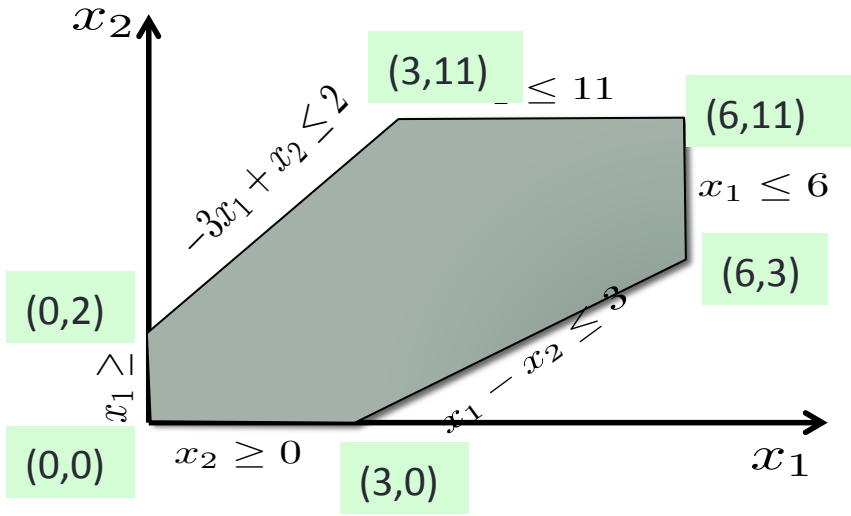
FINDING DUAL SOLUTION FROM DICTIONARY

Linear Programming Problem

From Two Weeks Ago.

$$
\begin{array}{lrrcr}
\text{max.} & x_1 & +2x_2 & & \\
\text{s.t.} & -3x_1 & +x_2 & \leq & 2 \\
 & & +x_2 & \leq & 11 \\
 & x_1 & -x_2 & \leq & 3 \\
 & x_1 & & \leq & 6 \\
 & x_1, & x_2 & \geq & 0
\end{array}
$$

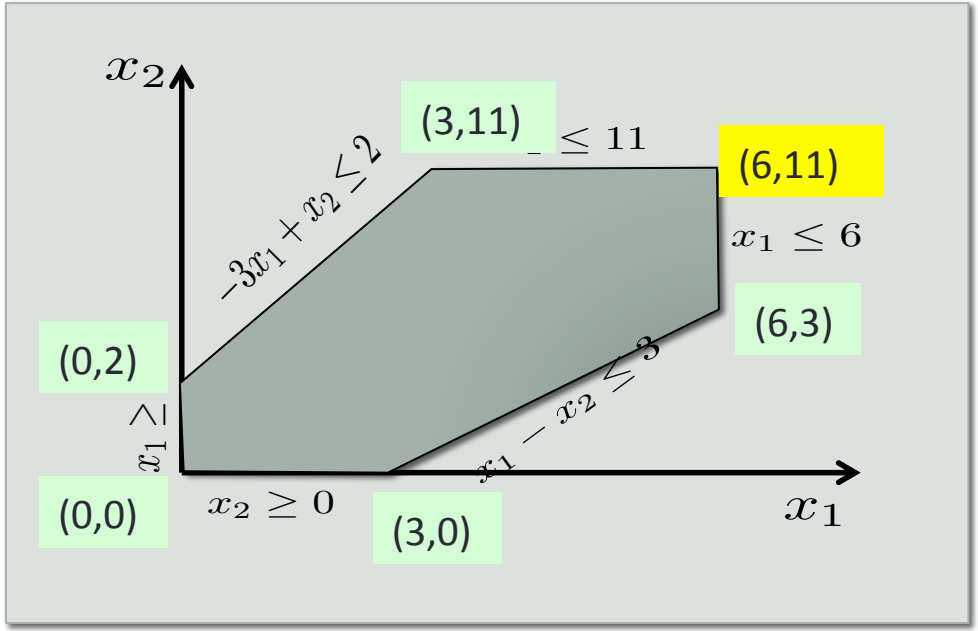
Note: Not drawn to scale



Goal: Solve LP using Simplex and visualize!

Final Dictionary

$$
\begin{array}{rcrrr}
x_3 & = & 9 & +x_4 & -3x_6 \\
x_1 & = & 6 & & -x_6 \\
x_2 & = & 11 & -x_4 & +0x_6 \\
x_5 & = & 8 & -x_4 & +x_6 \\
\hline
z & = & 28 & -2x_4 & -x_6
\end{array}
$$



How to read off the dual solution

$$
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x_3 & = & 9 & +x_4 & -3x_6 \\
x_1 & = & 6 & & -x_6 \\
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\hline
z & = & 28 & -2x_4 & -x_6
\end{array}
$$

x_1	x_2	x_3	x_4	x_5	x_6
y_5	y_6	y_1	y_2	y_3	y_4

Reading off the dual from the final dictionary

$\mathbf{x_B}$	$\mathbf{b}$	$+A\mathbf{x_I}$
z	z_0	$+\mathbf{c}^\intercal\mathbf{x_I}$

${\mathbf{x_I}}^c$	$-\mathbf{c}$	$-A^\intercal{\mathbf{x_B}}^c$
d	$-z_0$	$-\mathbf{b}^\intercal{\mathbf{x_B}}^c$