

$$\begin{aligned}
 \min \quad & 3x_1 + 2x_2 + 4x_3 \\
 \text{s.t.} \quad & x_1 + 4x_2 \geq 6 \\
 & 2x_1 - 3x_2 + 2x_3 \geq 4 \\
 & x_1, x_2, x_3 \geq 0
 \end{aligned}$$

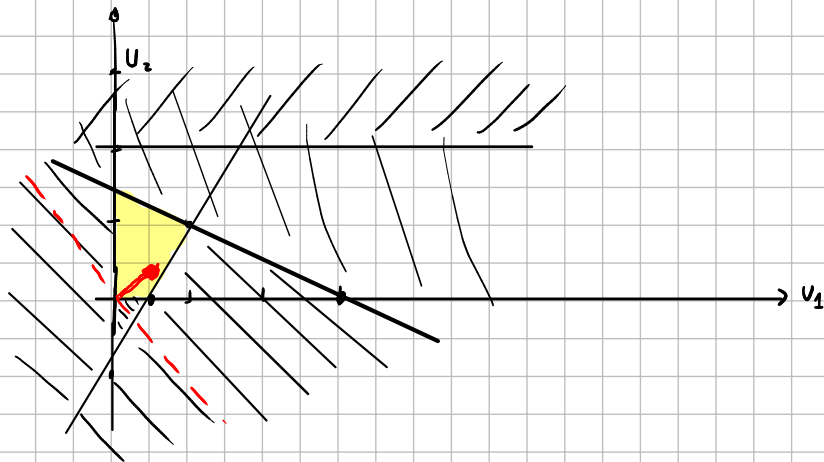
DUALE
 $u_1, u_2 \geq 0$

$$u_1 + 2u_2 \leq 3$$

$$4u_1 - 3u_2 \leq 2$$

$$+ 2u_2 \leq 4$$

$$u_1, u_2 \geq 0$$



$$\rightarrow \begin{cases} u_1 + 2u_2 = 3 \\ 4u_1 - 3u_2 = 2 \end{cases}$$

$$-11u_2 = -10 \rightarrow$$

$$\begin{cases} u_2 = \frac{10}{11} \\ u_1 = \frac{13}{11} \end{cases}$$

$$z_0 = \frac{78 + 40}{11} = \frac{118}{11}$$

Risolvo con PRIMA LE

$$\begin{array}{cccccccc}
 -3 & -1 & -2 & 1 & 1 & 0 & 0 & -10 \\
 1 & 4 & 0 & -1 & 0 & 1 & 0 & 6 \\
 2 & -3 & 2 & 0 & -1 & 0 & 1 & 4 \\
 x_1 & x_2 & x_3 & x_4 & x_5 & a_1 & a_2 &
 \end{array}$$

\rightarrow

$$\begin{array}{cccccccc}
 0 & -\frac{11}{2} & 1 & 1 & -\frac{7}{2} & 0 & \frac{3}{2} & -4 \\
 0 & \frac{11}{2} & -1 & -1 & \frac{1}{2} & 1 & -\frac{1}{2} & 4 \\
 1 & -\frac{3}{2} & 1 & 0 & -\frac{1}{2} & 0 & \frac{1}{2} & 2 \\
 x_1 & x_2 & x_3 & x_4 & x_5 & a_1 & a_2 &
 \end{array}$$

$$\begin{array}{cccccccc}
 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\
 0 & 1 & -\frac{2}{11} & -\frac{2}{11} & \frac{1}{11} & \frac{2}{11} & -\frac{1}{11} & \frac{8}{11} \\
 1 & 0 & \frac{8}{11} & -\frac{3}{11} & -\frac{8}{11} & \frac{3}{11} & * & \frac{34}{11} \\
 x_1 & x_2 & x_3 & x_4 & x_5 & a_1 & a_2 &
 \end{array}$$

\rightarrow

SOLUZIONE OTTIMA PROBLEMA
 ARTIFICIALE

$$\begin{aligned} \min \quad & 12x_1 + 6x_2 - 2x_3 \\ & x_1 + \quad + 3x_3 = 15 \\ & 3x_1 - 2x_2 + 5x_3 \leq 18 \\ & x_{1,2,3} \geq 0 \end{aligned}$$

$$\begin{array}{cccccc|c} 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ -1 & 0 & -3 & 0 & 0 & -15 & 0 \\ \hline 1 & 0 & 3 & 0 & 1 & 15 & 15 \\ 3 & -2 & 5 & 1 & 0 & 18 & 18 \\ \hline x_1 & x_2 & x_3 & x_4 & a_1 & & \end{array}$$

$$\begin{array}{cccccc|c} 0 & -\frac{2}{3} & -\frac{4}{3} & \frac{1}{3} & 0 & -9 & \\ 0 & \frac{2}{3} & \frac{1}{3} & -\frac{1}{3} & 1 & 9 & \\ 1 & -\frac{2}{3} & \frac{5}{3} & \frac{1}{3} & 0 & 6 & \end{array}$$

$$\begin{array}{cccccc|c} 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 2 & -\frac{1}{2} & \frac{3}{2} & \frac{27}{2} & \frac{27}{2} \\ 1 & 0 & 3 & 0 & 1 & 15 & 15 \end{array} \quad \begin{array}{l} \text{OTTIMA} \\ \text{FINE PRIM} \\ \text{FASE} \end{array}$$

$$\begin{array}{cccc|c} 12 & -6 & -2 & 0 & \\ \rightarrow & 0 & 0 & -50 & 3 & -261 \\ & 0 & 1 & 2 & -\frac{1}{2} & \frac{27}{2} \\ & 1 & 0 & 3 & 0 & 15 \end{array}$$

$$\begin{array}{cccc|c} \frac{50}{3} & 0 & 0 & 3 & -111 & \\ -\frac{2}{3} & 1 & 0 & -\frac{1}{2} & \frac{7}{2} & \\ \frac{1}{3} & 0 & 1 & 0 & 5 & \end{array} \quad \begin{array}{l} \text{SOLUZIONE} \\ x = (0, \frac{7}{2}, 5, 0) \end{array}$$

DUALE:

DALLA TABELLA

$$u_2 \leq 0$$

→

$$\begin{aligned} \max \quad & 15u_1 + 18u_2 \\ & u_1 + 3u_2 \leq 12 \\ & -2u_2 \leq 6 \\ & 3u_1 + 5u_2 \leq -2 \\ & u_2 \leq 0 \end{aligned}$$

$$\begin{cases} (u_1 - 3u_2 - 12)x_1 = 0 \\ (u_2 - 3)x_2 = 0 \\ (-3u_1 + 5u_2 - 2)x_3 = 0 \\ (x_1 + 3x_3 - 15)u_1 = 0 \\ (3x_1 - 2x_2 + 5x_3 - 18)u_2 = 0 \end{cases}$$

RISOLUZIONE SIMPLESSO DUALE

0	$C_F T \geq 0$	
I	$B^{-1} F$	$B^{-1} b$

2 RIMUOVO IL VINCOLO DEL PRIMA
EFFETTO IL PIVOT "AL CONTRARIO"
CIOE SCEGLIENDO UNA RIGA GN $B^{-1}b$ NEG.