

$$Max \quad z = -5x_1 + 5x_2 + 13x_3$$

Sub to

$$-x_1 + x_2 + 3x_3 \leq 20 \quad x_4$$

$$12x_1 + 4x_2 + 10x_3 \leq 90 \quad x_5$$

$$\begin{array}{c|ccc|cc|c} z & x_1 & x_2 & x_3 & x_4 & x_5 & R \\ \hline 1 & 0 & 0 & 2 & 5 & 0 & 100 \\ x_2 & 0 & 1 & 3 & 1 & 0 & 20 \\ x_5 & 0 & 16 & 0 & -2 & -4 & 10 \end{array}$$

$$(a) \quad b_{new} = \begin{bmatrix} 30 \\ 90 \end{bmatrix}$$

$$\begin{array}{c|ccc|cc|c} z & x_1 & x_2 & x_3 & x_4 & x_5 & R \\ \hline 1 & 0 & 0 & 2 & 5 & 0 & 150 \\ x_2 & 0 & 1 & 3 & 1 & 0 & 30 \\ x_5 & 0 & 16 & 0 & -2 & -4 & -30 \end{array}$$

$$\begin{bmatrix} 1 & 0 \\ -4 & 1 \end{bmatrix} \begin{bmatrix} 30 \\ 90 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ -4 & 1 \end{bmatrix} \begin{bmatrix} 50 \\ 90 \end{bmatrix} \begin{bmatrix} 30 \\ 90 \end{bmatrix}$$

$$\begin{array}{c|ccc|cc|c} 1 & 16 & 0 & 0 & 1 & 1 & 120 \\ 0 & 23 & 1 & 0 & -5 & 3/2 & -15 \end{array}$$

$$0 \quad -8 \quad 0 \quad 1 \quad 2 \quad -1/2 \quad 15$$

$$103/5 \quad 1/5 \quad 0 \quad 0 \quad 13/10 \quad 117$$

$$\begin{array}{c|ccc|cc|c} 0 & -23/5 & -1/5 & 0 & 1 & -3/10 & 3 \\ 0 & 6/5 & 2/5 & 1 & 0 & 1/10 & 9 \end{array}$$

$$x_1 = 0$$

$$x_2 = 0$$

$$x_3 = 9$$

$$(b) \quad b_{new} = \begin{bmatrix} 20 \\ 70 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ -4 & 1 \end{bmatrix} \begin{bmatrix} 20 \\ 70 \end{bmatrix}$$

$$\begin{bmatrix} 5 & 0 \end{bmatrix} \begin{bmatrix} 20 \\ 70 \end{bmatrix}$$

$$\begin{array}{c|ccc|cc|c} 1 & 16 & 0 & 0 & 1 & 1 & 90 \\ 0 & 23 & 1 & 0 & -5 & 3/2 & 5 \\ 0 & -8 & 0 & 1 & 2 & -1/2 & 5 \end{array}$$

$$x_1 = 0$$

$$x_2 = 5 \quad z = 90$$

$$x_3 = 5$$

$$(c) \quad b_{new} = \begin{bmatrix} 10 \\ 100 \end{bmatrix}$$

7.2-2

$$\begin{array}{c|ccc|cc|c} z & x_1 & x_2 & x_3 & x_4 & x_5 & R \\ \hline 1 & 0 & 0 & 2 & 5 & 0 & 50 \\ x_2 & 0 & 1 & 3 & 1 & 0 & 10 \\ x_5 & 0 & 16 & 0 & -2 & -4 & 60 \end{array}$$

$$\begin{bmatrix} 1 & 0 \\ -4 & 1 \end{bmatrix} \begin{bmatrix} 10 \\ 100 \end{bmatrix} \begin{bmatrix} 50 \\ 10 \end{bmatrix} \begin{bmatrix} 10 \\ 100 \end{bmatrix}$$

$$x_2 = 10 \quad x_3 = 0$$

$$z = 50$$

$$(d) \quad C_{new} = [-5 \ 5 \ 8]$$

$$\begin{array}{c|ccc|cc|c} z & x_1 & x_2 & x_3 & x_4 & x_5 & R \\ \hline 1 & 0 & 0 & 7 & 5 & 0 & 100 \\ x_2 & 0 & 1 & 3 & 1 & 0 & 20 \\ x_5 & 0 & 16 & 0 & -2 & -4 & 10 \end{array}$$

$$\begin{bmatrix} 5 & 0 \end{bmatrix} \begin{bmatrix} 3 \\ 10 \end{bmatrix} - [8]$$

$$z = 100$$

$$x_1 = 0$$

$$x_2 = 20$$

$$x_3 = 0$$

$$(e) \quad C_{new} = [-2 \ 5 \ 13]$$

$$A_{new} = \begin{bmatrix} 0 & 1 & 3 \\ 5 & 4 & 10 \end{bmatrix}$$

$$\begin{array}{c|ccc|cc|c} z & x_1 & x_2 & x_3 & x_4 & x_5 & R \\ \hline 1 & 2 & 0 & 2 & 5 & 0 & 100 \\ x_2 & 0 & 1 & 3 & 1 & 0 & 20 \\ x_5 & 0 & 5 & 0 & -2 & -4 & 10 \end{array}$$

$$\begin{bmatrix} 1 & 0 \\ -4 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 5 \end{bmatrix}$$

$$\begin{bmatrix} 5 & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 5 \end{bmatrix} - [-2]$$

$$x_1 = 0 \quad x_2 = 20$$

$$x_3 = 0 \quad z = 100$$

(f)

$$C_{\text{new}} = [-5 \ 6 \ 13]$$

$$A_{\text{new}} = \begin{bmatrix} -1 & 2 & 3 \\ 12 & 5 & 10 \end{bmatrix}$$

$$\begin{array}{c|cccc|c} Z & x_1 & x_2 & x_3 & x_4 & x_5 & R \\ \hline 1 & 0 & 4 & 2 & 5 & 0 & 100 \\ 0 & -1 & 2 & 3 & 1 & 0 & 20 \\ 0 & 16 & -3 & -2 & -4 & 1 & 10 \end{array}$$

$$\begin{bmatrix} 1 & 0 \\ -4 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \end{bmatrix}$$

$$\begin{bmatrix} 5 & 0 \\ 2 & 5 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \end{bmatrix} - \begin{bmatrix} 6 \\ 13 \end{bmatrix}$$

$$R_1/2$$

$$3R_1 + R_2$$

$$\begin{array}{c|cccc|c} 1 & 2 & 0 & -4 & 3 & 0 & 60 \\ \hline 0 & -1/2 & 1 & 3/2 & 1/2 & 0 & 10 \\ 0 & 29/2 & 0 & 5/2 & -5/2 & 1 & 40 \end{array}$$

$$-4R_1 + R_3$$

$$20/3$$

$$16$$

改善

$$-3/2 + \frac{32}{16}$$

$$\times 2/3$$

$$9/2 - 4/2$$

$$+3/2 - 8/2$$

$$80/3 + 180/3$$

$$5/6 + 29/2$$

$$1 \quad 2/3 \quad 3/3 \quad 0 \quad 16/3 \quad 0 \quad 260/3$$

$$0 \quad -1/3 \quad 2/3 \quad 1 \quad 1/3 \quad 0 \quad 20/3$$

$$0 \quad 46/3 \quad -5/3 \quad 0 \quad -10/3 \quad 1 \quad 70/3$$

$$x_1 = 0$$

$$x_2 = 0$$

$$x_3 = 20/3$$

$$Z = \frac{260}{3}$$

$$\text{lost } R_1$$

$$-3R_1 + R_3$$

$$Z = 95$$

$$x_1 = 0$$

$$x_2 = 29/2$$

$$x_3 = 7/2$$

$$1 \quad 5/2 \quad 0 \quad 0 \quad 7/2 \quad 0 \quad 95$$

(h)

$$2x_1 + 3x_2 + 5x_3 \leq 50$$

60 ≤ 50 infeasible

restore

$$\begin{array}{c|cccc|c} Z & x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & R \\ \hline 1 & 0 & 0 & 2 & 5 & 0 & 0 & 100 \\ 0 & -1 & 1 & 3 & 1 & 0 & 0 & 20 \\ 0 & 16 & 0 & -2 & -4 & 1 & 0 & 10 \\ 0 & 2 & 3 & 5 & 0 & 0 & 1 & 50 \end{array}$$

9f

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$$0 \quad 11/4 \quad 1 \quad 0 \quad 1/2 \quad 3/4 \quad 20/2$$

$$0 \quad 27/2 \quad 0 \quad 0 \quad -5/2 \quad 1 \quad -1/2 \quad 15$$

$$0 \quad -5/4 \quad 0 \quad 1 \quad 3/4 \quad 0 \quad -1/4 \quad 5/2$$

$$-9/4 + 1/4 \quad 15/4 - 1/4$$

$$15/2 + 2/2$$

$$-15/2 + 4/2$$

$$2R_3 + R_2$$

$$-2R_3 + R_1$$

$$\begin{array}{c|cccc|c} 1 & 0 & 0 & 2 & 5 & 0 & 0 & 100 \\ \hline 0 & -1 & 1 & 3 & 1 & 0 & 0 & 20 \\ 0 & 16 & 0 & -2 & -4 & 1 & 0 & 10 \\ 0 & 5 & 0 & 4 & -3 & 0 & 1 & -10 \end{array}$$

$$-10/4 + 16$$

$$3/2 - 3/2$$

$$-1/2$$

$$-3R_3 + R_1$$

$$-3/2 + 10/2$$

$$(i) A_{new} = \begin{bmatrix} -1 & 1 & 3 \\ 10 & 5 & 10 \end{bmatrix}$$

$$b_{new} = \begin{bmatrix} 20 \\ 100 \end{bmatrix}$$

$$\begin{array}{c|cccc|c} z & x_1 & x_2 & x_3 & x_4 & x_5 & R \\ \hline 1 & 10 & 0 & 2 & 5 & 0 & 100 \\ 0 & -1 & 1 & 3 & 1 & 0 & 20 \\ 0 & 14 & 1 & -2 & -4 & 1 & 20 \end{array}$$

$$\begin{bmatrix} 1 & 0 \\ -4 & 1 \end{bmatrix} \begin{bmatrix} 20 \\ 100 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 \\ -4 & 1 \end{bmatrix} \begin{bmatrix} -1 & 1 & 3 \\ 10 & 5 & 10 \end{bmatrix}$$

$$\begin{bmatrix} 5 & 0 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 20 \\ 100 \end{bmatrix} \quad \begin{bmatrix} 5 & 0 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} -1 & 1 & 3 \\ 10 & 5 & 10 \end{bmatrix} - \begin{bmatrix} -5 & 5 & 13 \end{bmatrix}$$

$$\begin{array}{cccccc|c} 1 & 10 & 0 & 2 & 5 & 0 & 100 \\ 0 & -1 & 1 & 3 & 1 & 0 & 20 \\ 0 & 15 & 0 & -5 & -5 & 1 & 0 \end{array}$$

$$x_1 = 0$$

$$x_2 = 20 \quad z = 100$$

$$x_3 = 0$$

$$x_4 = 0$$

$$x_5 = 0$$