

Алгебраический симплекс - метод

Стандартная форма

$$x_1 + 3x_2 \leq 15$$

$$2x_1 + x_2 \leq 17$$

$$2x_1 + 3x_2 \leq 23$$

$$x_1 \geq 0, x_2 \geq 0$$

$$f = -40x_1 - 30x_2 \rightarrow \min$$

$$A = \begin{pmatrix} 1 & 3 \\ 2 & 1 \\ 2 & 3 \end{pmatrix}; X = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}; B = \begin{pmatrix} 15 \\ 17 \\ 23 \end{pmatrix}$$

$$AX \geq B: \begin{pmatrix} 1 & 3 \\ 2 & 1 \\ 2 & 3 \end{pmatrix} * \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \leq \begin{pmatrix} 15 \\ 17 \\ 23 \end{pmatrix}$$

Каноническая форма

$$x_1 + 3x_2 + y_1 = 15$$

$$2x_1 + x_2 + y_2 = 17$$

$$2x_1 + 3x_2 + y_3 = 23$$

$$x_1 \geq 0, x_2 \geq 0$$

$$y_1 \geq 0, y_2 \geq 0, y_3 \geq 0$$

$$f = -40x_1 - 30x_2 \rightarrow \min$$

$$N = 5; M = 3;$$

$$БП = 3(y_j); C_B = 2(x_i);$$

$$A = \begin{pmatrix} 1 & 3 & 1 & 0 & 0 \\ 2 & 1 & 0 & 1 & 0 \\ 2 & 3 & 0 & 0 & 1 \end{pmatrix}; X = \begin{pmatrix} x_1 \\ x_2 \\ y_1 \\ y_2 \\ y_3 \end{pmatrix}; B = \begin{pmatrix} 15 \\ 17 \\ 23 \end{pmatrix};$$

$$AX + Y = B:$$

$$\begin{pmatrix} 1 & 3 & 1 & 0 & 0 \\ 2 & 1 & 0 & 1 & 0 \\ 2 & 3 & 0 & 0 & 1 \end{pmatrix} * \begin{pmatrix} x_1 \\ x_2 \\ y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} 15 \\ 17 \\ 23 \end{pmatrix}$$

Решение

$$y_1 = 15 - x_1 - 3x_2$$

$$y_2 = 17 - 2x_1 - x_2 \text{ (гл. ур - e)}$$

$$y_3 = 23 - 2x_1 - 3x_2$$

0 итер:

$$x_1 = x_2 = 0, f = 0, y_1 = 15, y_2 = 17, y_3 = 23$$

$$x_1 \rightarrow \infty \sim x_1 \rightarrow y_2; y_2 \rightarrow x_1; x_1 - \text{БП}, y_2 - \text{С}_B$$

$$y_1 = 15 - x_1 = 0, x_1 = 15$$

$$y_2 = 17 - 2x_1 = 0, x_1 = 8.5 \rightarrow x_1 = 8.5, y_2 = 0$$

$$y_3 = 23 - 2x_1 = 0, x_1 = 11.5$$

$$x_1 = 8.5 - \frac{x_2}{2} - \frac{y_2}{2}$$

$$y_1 = 6.5 - 2.5x_2 + \frac{y_2}{2} \text{ (гл. ур - e)}$$

$$y_3 = 6 - 2x_2 + y_2$$

$$f = -340 - 10x_2 + 20y_2 \rightarrow \min$$

1 итер:

$$y_2 = x_2 = 0, f = -340, x_1 = 8.5, y_1 = 6.5, y_3 = 6$$

$$x_2 \rightarrow \infty \sim x_2 \rightarrow y_1; y_1 \rightarrow x_2; x_2 - \text{БП}, y_1 - \text{С}_B$$

$$x_1 = 8.5 - \frac{x_2}{2} = 0, x_2 = 17$$

$$y_1 = 6.5 - 2.5x_2 = 0, x_2 = \frac{13}{5} \rightarrow x_2 = \frac{13}{5}, y_1 = 0$$

$$y_3 = 6 - 2x_2 = 0, x_2 = 3$$

$$x_2 = \frac{13}{5} - \frac{2}{5}y_1 + \frac{y_2}{5}$$

$$x_1 = 7.2 + \frac{y_1}{5} - \frac{y_2 + 6}{10}$$

$$y_3 = 0.8 + 0.8y_1 + 0.6y_2$$

$$f = -366 + 4y_1 + 18y_2$$

2 итер:

$$y_1 = y_2 = 0, f = -366, x_1 = 7.2, y_3 = 0.8, x_2 = \frac{13}{5}$$