Задание 8

Для своих задач из Заданий 6 и 7 составить двойственные задачи и записать их решение

6. $\varphi = -X_1 + (1/2) X_2$

$$\begin{cases} X_1 \le 4 \\ X_2 \le 5 \\ X_1 + X_2 \ge 2 \\ X_2 \ge 0 \end{cases}$$

Перевод в канон:

$$X_1 + X_2 - X_3 = 2$$

(по условию)

$$-3 \le X_1 \le 4$$
$$0 \le X_2 \le 5$$
$$0 \le X_3 \le 7$$

$$A = (1 \quad 1 \quad -1)$$

$$d_* = \begin{pmatrix} -3 \\ 0 \\ 0 \end{pmatrix} \quad d^* = \begin{pmatrix} 4 \\ 5 \\ 7 \end{pmatrix} \quad C = \begin{pmatrix} -1 \\ \frac{1}{2} \\ 0 \end{pmatrix} \quad b = (2)$$

$X_{min} = (4, 0)$	$X_{max} = (-3, 5)$; $X_3 = 0$
$X_3 = 2$	$X = (-3, 5, 0)$
$X = (4, 0, 2)$	$J_Б = \{1\}$, $J_H = \{2, 3\}$
$J_Б = \{3\}$, $J_H = \{1, 2\}$	$u_1 \cdot (1) = -1$; $u_1 = -1$
$u_1 \cdot (-1) = 0$; $u_1 = 0$	$\Delta_1 = 0$

$\Delta_1 = -1 - 0 = -1 < 0 \quad +$ | $\Delta_2 = \frac{1}{2} - (-1)\cdot 1 = \frac{3}{2} > 0 \quad +$

$\Delta_2 = \frac{1}{2} - 0 = \frac{1}{2} > 0 \quad +$ | $\Delta_3 = 0 - (-1)\cdot(-1) = -1 < 0 \quad +$

$\Delta_3 = 0 - 0 = 0$

$$\psi(y, v, w) = 2y_1 + 3v_1 + 4w_1 + 5w_2 + 7w_3$$

$$\begin{cases} y_1 - v_1 + w_1 = -1 \\ y_1 - v_2 + w_2 = \frac{1}{2} \\ y_1 - v_3 + w_3 = 0 \\ v \geq 0 \quad w \geq 0 \end{cases}$$

$\psi \to max$

$y^0 = (0)$

$v_1 = 0 \qquad w_1 = \cancel{0}\ -1$

$v_2 = \cancel{0}\ -\frac{1}{2} \qquad w_2 = 0$

$v_3 = 0 \qquad w_3 = 0$

$\lambda^0 = (0, 0, -\frac{1}{2}, 0, -1, 0, 0)$

$\psi(\lambda^0) = -4 = \varphi_{min}$

$\psi \to min$

$y^0 = (-1)$

$w_1 = 0 \qquad v_1 = 0$

$w_2 = \cancel{0}\ \frac{3}{2} \qquad v_2 = 0$

$w_3 = 0 \qquad v_3 = \cancel{0}\ 1$

$\lambda^0 = (-1, 0, 0, 1, 0, \frac{3}{2}, 0)$

$\psi(\lambda^0) = -2 + 5\cdot\frac{3}{2} = \frac{11}{2} = \varphi_{max}$

7. $A = \begin{pmatrix} 3 & 0 & -1 & 0 & 1 \\ -2 & 0 & 0 & 3 & 0 \\ 0 & 4 & 0 & 0 & 1 \end{pmatrix} \quad b = \begin{pmatrix} 30 \\ -11 \\ 2 \end{pmatrix}$

$$\varphi(x) = 5x_1 - 4x_3 + 15x_4 + 5x_5 \to max$$

$d_* = \begin{pmatrix} 2 \\ 0 \\ 1 \\ 0 \\ -1 \end{pmatrix} \qquad d^* = \begin{pmatrix} 10 \\ 4 \\ 5 \\ 4 \\ 3 \end{pmatrix}$

$$\psi(y, v, w) = (30y_1 - 11y_2 + 2y_3) - (2v_1 + v_3 - v_5) + (10w_1 + 4w_2 + 5w_3 + 4w_4 + 3w_5) \longrightarrow min$$

$$\begin{cases} 3y_1 - 2y_2 - v_1 + w_1 = 5 \\ 4y_3 - v_2 + w_2 = 0 \\ -y_1 - v_3 + w_3 = -4 \\ 3y_2 - v_4 + w_4 = 15 \\ y_1 + y_3 - v_5 + w_5 = 5 \end{cases}$$

$$v \geq 0 \quad w \geq 0$$

$$y^0 = \begin{pmatrix} 4 \\ 5 \\ 1 \end{pmatrix} \quad \begin{aligned} v_1 &= 0 & w_1 &= 3 \\ v_2 &= 4 & w_2 &= 0 \\ v_3 &= 0 & w_3 &= 0 \\ v_4 &= 0 & w_4 &= 0 \\ v_5 &= 0 & w_5 &= 0 \end{aligned}$$

$$\lambda^0 = (4, 5, 1, 0, 4, 0, 0, 0, 3, 0, 0, 0, 0)$$

$$\psi(\lambda^0) = (30 \cdot 4 - 55 + 2) - 0 + 30 = 97 = \psi_{max}$$