

Контрольна робота Губенук, ІПС-22

Варіант 1.

1. Розв'язати задачу графічно $h = -4x_1 + 3x_2 + x_4 - x_5 \rightarrow \max$

$$2x_1 - x_2 - x_3 = -1$$

$$x_3 = 1 + 2x_1 - x_2 \geq 0$$

$$x_1 - 3x_2 - x_4 = -13$$

$$x_4 = 13 + x_1 - 3x_2 \geq 0$$

$$4x_1 + x_2 + x_5 = 26$$

$$x_5 = 26 - 4x_1 - x_2 \geq 0$$

$$x_1 - 3x_2 + x_5 = 26$$

$$x_6 = 0 - x_1 + 3x_2 \geq 0$$

$$x_i \geq 0$$

$$h = -4x_1 + 3x_2 + (13 + x_1 - 3x_2) -$$

$$- (26 - 4x_1 - x_2) = x_1 + x_2 - 13 \rightarrow \max$$

Отже $h = x_1 + x_2 - 13 \rightarrow \max$

$$2x_1 - x_2 \geq -1$$

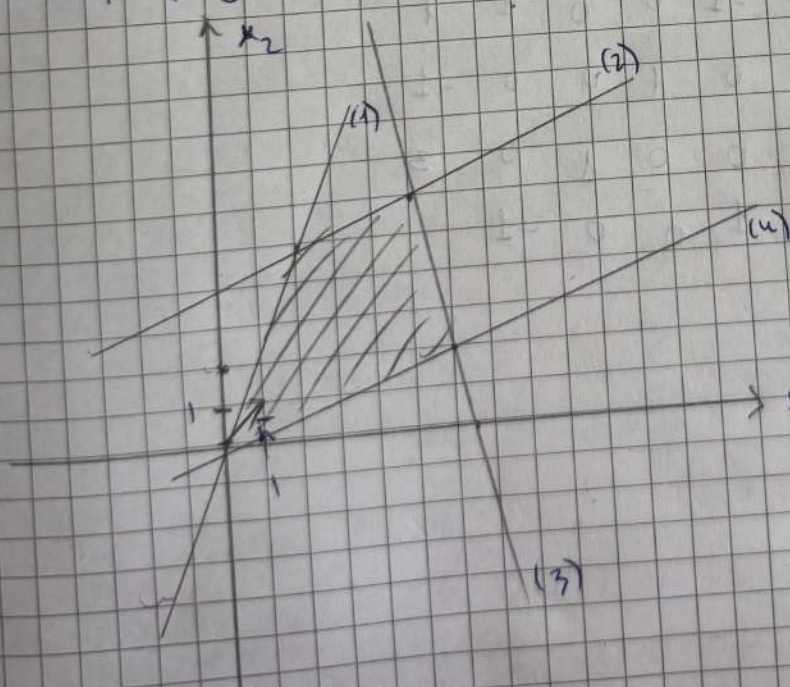
$$x_1 - 3x_2 \geq -13$$

$$-4x_1 - x_2 \geq -26$$

$$-x_1 + 3x_2 \geq 0$$

$$x_i \geq 0$$

Вектор-градієнт $\vec{n}(1, 1)$



Максимум в
точці B

$$\begin{cases} x_1 - 3x_2 = -13 \\ -4x_1 - x_2 = -26 \end{cases} \Rightarrow \begin{cases} x_1 = 5 \\ x_2 = 6 \end{cases}$$

$$h_{\max} = 5 + 6 - 13 = 2$$

Оптимальний розв'язок:

$$x^* (5; 6; 5; 0; 0; 13)$$

$$\Delta \quad \begin{array}{ccccccc} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & -7 & 0 & 4 & 0 & 1 & -1 & -1 & 1 \end{array}$$

$$h = x_1 + 2x_2 \rightarrow \max$$

$$5x_1 - 2x_2 \geq 3$$

$$x_1 + x_2 \geq 1$$

$$-3x_1 + x_2 \leq 3$$

$$3x_1 + 3x_2 \leq 9$$

$$x_i \geq 0$$

go

(ЗАП)

$$5x_1 - 2x_2 + x_3 = 3$$

$$x_1 + x_2 - x_4 = 1$$

$$-3x_1 + x_2 + x_5 = 3$$

$$3x_1 + 3x_2 + x_6 = 9$$

Двоїста задача:

$$h^*(y) = 3y_1 - y_2 + 3y_3 + 3y_4 \rightarrow \min$$

$$5y_1 - y_2 - 3y_3 + 3y_4 \geq 1$$

$$-2y_1 - y_2 + y_3 + 3y_4 \geq 2$$

$$y_i \geq 0$$

КЗАП

$$5y_1 - y_2 - 3y_3 + 3y_4 - y_5 + z_1 = 1$$

$$-2y_1 - y_2 + y_3 + 3y_4 - y_6 + z_2 = 2$$

		3	-1	3	3	0	0	10	10		
05	y_5	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	8	$h_{min}(y) = 3y_1 - y_2 + 3y_3 +$
10	z_1	5	-1	-3	3	1	0	1	0	1	$\frac{1}{3} + 9y_4 + 10z_1 + 10z_2 \rightarrow \min$
10	z_2	2	-1	1	3	0	-1	0	1	2	$\frac{2}{3}$
	Δ	-27	19	23	-51	10	10	0	0		$\frac{1}{3}$
9	y_4	$\frac{5}{3}$	$-\frac{1}{3}$	1	1	$-\frac{1}{3}$	0	$\frac{1}{3}$	0		$\frac{1}{3}$
10	z_2	-7	0	4	0	1	-1	-1	1	1	$\frac{1}{4}$
	Δ	58	2	-28	0	-7	10	-17	0		

$$\Delta_j = c_j - (c \cdot A_j)$$

CS	XS	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	b
9	y ₄	$-\frac{1}{12}$	$\frac{1}{3}$	0	1	$-\frac{1}{12}$	$-\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{7}{12}$
3	y ₃	$-\frac{7}{4}$	0	1	0	$\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
	Δ	9	2	0	0	0	3	10	7	6

$$y^* = (0, 0, \frac{1}{4}, \frac{7}{12})$$

$$h^*(y) = 6$$

pozbywa głoćcioi

CS	YS	A ₀	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆
0	y ₅	-1	-5	1	3	-3	1	0
0	y ₆	-2	2	1	-1	0	0	1
	Δ		-3	1	-3	-9	0	0

y ₅	0	1	-7	0	4	0	1	-1
y ₄	0	$\frac{2}{3}$	$-\frac{2}{3}$	$-\frac{1}{3}$	$\frac{1}{3}$	1	0	$-\frac{1}{3}$
Δ		-9	-2	0	0	0	-3	

- onł: p-oc.

$$z_1 = 1$$

$$z_2 = 2$$

$$y_1 - y_2 + 3y_3 +$$

$$z_1 + 10z_2 \rightarrow \text{min}$$

$$3. \quad x = \left(\frac{21}{4}, \frac{3}{2} \right)^T \quad y = \left(0, \frac{1}{4}, \frac{1}{4}, 0, 0, 0 \right)^T$$

$$h(y) = 3y_1 + 42y_2 + 6y_3 - 4y_4 \rightarrow \min$$

$$-y_1 + 6y_2 + 2y_3 - 4y_4 \geq 2$$

$$y_1 + 7y_2 - 3y_3 - y_4 \geq 1$$

$$y_i \geq 0$$

$$h^*(x) = 2x_1 + x_2 \rightarrow \max$$

- globalna

$$h^*(x) = -2x_1 - x_2 \rightarrow \max$$

$$-x_1 + x_2 \leq 3$$

$$-x_1 + x_2 + x_3 = 3$$

$$6x_1 + 7x_2 \leq 42$$

$$6x_1 + 7x_2 + x_4 = 42$$

$$2x_1 - 3x_2 \leq 6$$

$$2x_1 - 3x_2 + x_5 = 6$$

$$-4x_1 - x_2 \leq -4$$

$$4x_1 + x_2 - x_6 + \frac{1}{10}z = 4$$

$$x_i \geq 0$$

$$h(x) = -2x_1 + x_2 + 10z \rightarrow \max$$

		-2	-1						10	
CB	X6	A0	A1	A2	A3	A4	A5	A6	A7	θ
0	X3	3	-1	1	1	0	0	0	0	-3
0	X4	42	6	7	0	1	0	0	0	7
0	X5	6	2	-3	0	0	1	0	0	3
10	Z	4	(4)	1	0	0	0	-1	1	1
	Δ	-42	-42	-1	0	0	0	10	0	
0	X3	4	0	(5/4)	1	0	0	-1/4	1/4	16/5
0	X4	36	0	11/2	0	1	0	3/2	-3/2	22/11
0	X5	4	0	-7/2	0	0	1	1/2	-1/2	
-2	X1	1	1	1/4	0	0	0	-1/4	1/4	4
	Δ	0	0	-1/2	0	0	0	-1/2	21/2	

CB	YB	A ₀	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	θ
-1	X ₂	$\frac{16}{5}$	0	1	$\frac{4}{5}$	0	0	$-\frac{1}{5}$	$\frac{1}{5}$	
0	X ₄	$\frac{92}{5}$	0	0	$-\frac{22}{5}$	1	0	$\frac{13}{5}$	$-\frac{13}{5}$	$\frac{92}{13}$
0	X ₅	$\frac{26}{5}$	0	0	$\frac{14}{5}$	0	1	$-\frac{1}{5}$	$\frac{1}{5}$	
-2	X ₁	$-\frac{1}{5}$	1	0	$-\frac{1}{5}$	0	0	$-\frac{1}{5}$	$-\frac{1}{5}$	
	Δ		0	0	$\frac{2}{5}$	0	0	$-\frac{3}{5}$	$\frac{53}{5}$	

-1	X ₂	$\frac{60}{13}$	0	1	$\frac{6}{13}$	$-\frac{1}{13}$	0	0	0	10
0	X ₆	$\frac{92}{13}$	0	0	$-\frac{22}{13}$	$\frac{5}{13}$	0	1	-1	
0	X ₅	$\frac{216}{13}$	0	0	$\frac{33}{13}$	$\frac{1}{13}$	1	0	0	$\frac{27}{4}$
-2	X ₁	$\frac{21}{13}$	1	0	$-\frac{7}{13}$	$\frac{1}{13}$	0	0	0	
	Δ		0	0	$-\frac{8}{13}$	$\frac{3}{13}$	0	0	10	

-1	X ₂	$\frac{3}{2}$	0	1	0	$\frac{1}{16}$	$-\frac{3}{16}$	0	0	
0	X ₆	$\frac{37}{2}$	0	0	0	$\frac{7}{16}$	$\frac{11}{16}$	1	-1	
0	X ₃	$\frac{27}{4}$	0	0	1	$\frac{1}{32}$	$\frac{13}{32}$	0	0	
-2	X ₁	$\frac{21}{4}$	1	0	0	$\frac{3}{32}$	$\frac{1}{4}$	0	0	
	Δ		0	0	0	$\frac{1}{4}$	$\frac{1}{4}$	0	10	

- оптимальний p-ок

Тоді $x^* = (\frac{21}{4}, \frac{3}{2})$ є оптимальним.

$$h^*(x) = 12$$

$$h(y) = \frac{42}{4} + \frac{6}{4} = 12.$$

За значеннями
оптимальними

Δ маємо, що
розв'язками

x^* та y^* є