

## Ciklusi

$$z = 10x_1 - 57x_2 - 9x_3 - 24x_4$$

$$w_1 = -0.5x_1 + 5.5x_2 + 2.5x_3 - 9x_4$$

$$w_2 = -0.5x_1 + 1.5x_2 + 0.5x_3 - x_4$$

$$x_3 = 1 - x_1$$

$$x_i, w_i \geq 0$$

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0 | 10    | -57   | -9    | -24   | 0     | 0     | 0     |
| $w_1$ | 0 | 0.5   | -5.5  | -2.5  | 9     | 1     | 0     | 0     |
| $w_2$ | 0 | 0.5   | -1.5  | -0.5  | 1     | 0     | 1     | 0     |
| $w_3$ | 1 | 1     | 0     | 0     | 0     | 0     | 0     | 1     |

$$x_1 \leq \min\{\frac{0}{0.5}, \frac{0}{0.5}, \frac{1}{1}\} = 0$$

$$x_1 \leftrightarrow w_1 \text{ ili } x_1 \leftrightarrow w_2.$$

$$\text{Biramo: } x_1 \leftrightarrow w_1.$$

### 1. iteracija:

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0 | 0     | 53    | 41    | -204  | -20   | 0     | 0     |
| $x_1$ | 0 | 1     | -11   | -5    | 18    | 2     | 0     | 0     |
| $w_2$ | 0 | 0     | 4     | 2     | -8    | -1    | 1     | 0     |
| $w_3$ | 1 | 0     | 11    | 5     | -18   | -2    | 0     | 1     |

$$x_2 \leq \min\{\frac{0}{4}, \frac{1}{11}\} = 0$$

$$x_2 \leftrightarrow w_2.$$

### 2. iteracija:

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$  | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|--------|-------|
| -z    | 0 | 0     | 0     | 14.5  | -98   | -6.75 | -13.25 | 0     |
| $x_1$ | 0 | 1     | 0     | 0.5   | -4    | -0.75 | 2.75   | 0     |
| $x_2$ | 0 | 0     | 1     | 0.5   | -2    | -0.25 | 0.25   | 0     |
| $w_3$ | 1 | 0     | 0     | -0.5  | 4     | 0.75  | -2.75  | 1     |

$$x_3 \leq \min\{\frac{0}{0.5}, \frac{0}{0.5}\} = 0$$

$$x_3 \leftrightarrow x_1 \text{ ili } x_3 \leftrightarrow x_2.$$

$$\text{Biramo: } x_3 \leftrightarrow x_1.$$

### 3. iteracija:

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0 | -29   | 0     | 0     | 18    | 15    | -93   | 0     |
| $x_3$ | 0 | 2     | 0     | 1     | -8    | -1.5  | 5.5   | 0     |
| $x_2$ | 0 | -1    | 1     | 0     | 2     | 0.5   | -2.5  | 0     |
| $w_3$ | 1 | 1     | 0     | 0     | 0     | 0     | 0     | 1     |

$$x_4 \leq \min\{\frac{0}{2}, \frac{1}{0}\} = 0$$

$$x_4 \leftrightarrow x_2.$$

### 4. iteracija:

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0 | -20   | -9    | 0     | 0     | 10.5  | -70.5 | 0     |
| $x_3$ | 0 | -2    | 4     | 1     | 0     | 0.5   | -4.5  | 0     |
| $x_4$ | 0 | -0.5  | 0.5   | 0     | 1     | 0.25  | -1.25 | 0     |
| $w_3$ | 1 | 1     | 0     | 0     | 0     | 0     | 0     | 1     |

$$w_1 \leq \min\left\{\frac{0}{0.5}, \frac{0}{0.25}, \frac{1}{0}\right\} = 0$$

$$w_1 \leftrightarrow x_3 \text{ ili } w_1 \leftrightarrow x_4.$$

Biramo:  $w_1 \leftrightarrow x_3$ .

### 5. iteracija:

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0 | 22    | -93   | -21   | 0     | 0     | 24    | 0     |
| $w_1$ | 0 | -4    | 8     | 2     | 0     | 1     | -9    | 0     |
| $x_4$ | 0 | 0.5   | -1.5  | -0.5  | 1     | 0     | 1     | 0     |
| $w_3$ | 1 | 1     | 0     | 0     | 0     | 0     | 0     | 1     |

$$w_2 \leq \min\left\{\frac{0}{1}, \frac{1}{0}\right\} = 0$$

$$w_2 \leftrightarrow x_4.$$

### 6. iteracija:

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0 | 10    | -57   | -9    | -24   | 0     | 0     | 0     |
| $w_1$ | 0 | 0.5   | -5.5  | -2.5  | 9     | 1     | 0     | 0     |
| $w_2$ | 0 | 0.5   | -1.5  | -0.5  | 1     | 0     | 1     | 0     |
| $w_3$ | 1 | 1     | 0     | 0     | 0     | 0     | 0     | 1     |

## Bland-ovo pravilo

### 5. iteracija:

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0 | 22    | -93   | -21   | 0     | 0     | 24    | 0     |
| $w_1$ | 0 | -4    | 8     | 2     | 0     | 1     | -9    | 0     |
| $x_4$ | 0 | 0.5   | -1.5  | -0.5  | 1     | 0     | 1     | 0     |
| $w_3$ | 1 | 1     | 0     | 0     | 0     | 0     | 0     | 1     |

$$x_1 \leq \min\{\frac{0}{0.5}, \frac{1}{1}\} = 0$$

$$x_1 \leftrightarrow x_4.$$

### 6. iteracija:

| baza  | b | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0 | 0     | -27   | 1     | -44   | 0     | -20   | 0     |
| $w_1$ | 0 | 0     | -4    | -2    | 8     | 1     | -1    | 0     |
| $x_1$ | 0 | 1     | -3    | -1    | 2     | 0     | 2     | 0     |
| $w_3$ | 1 | 0     | 3     | 1     | -2    | 0     | -2    | 1     |

$$x_3 \leq \min\{\frac{1}{1}\} = 1$$

$$x_3 \leftrightarrow w_3.$$

### 7. iteracija:

| baza  | b  | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|----|-------|-------|-------|-------|-------|-------|-------|
| -z    | -1 | 0     | -30   | 0     | -42   | 0     | -18   | -1    |
| $w_1$ | 2  | 0     | 2     | 0     | 4     | 1     | -5    | 2     |
| $x_1$ | 1  | 1     | 0     | 0     | 0     | 0     | 0     | 1     |
| $x_3$ | 1  | 0     | 3     | 1     | -2    | 0     | -2    | 1     |

## Leksikografsko pravilo

$$z = 10x_1 - 57x_2 - 9x_3 - 24x_4$$

$$w_1 = \varepsilon_1 - 0.5x_1 + 5.5x_2 + 2.5x_3 - 9x_4$$

$$w_2 = \varepsilon_2 - 0.5x_1 + 1.5x_2 + 0.5x_3 - x_4$$

$$x_3 = 1 + \varepsilon_3 - x_1$$

$$x_i, w_i \geq 0, 0 < \varepsilon_3 < \varepsilon_2 < \varepsilon_1$$

| baza  | b                   | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|---------------------|-------|-------|-------|-------|-------|-------|-------|
| -z    | 0                   | 10    | -57   | -9    | -24   | 0     | 0     | 0     |
| $w_1$ | $\varepsilon_1$     | 0.5   | -5.5  | -2.5  | 9     | 1     | 0     | 0     |
| $w_2$ | $\varepsilon_2$     | 0.5   | -1.5  | -0.5  | 1     | 0     | 1     | 0     |
| $w_3$ | $1 + \varepsilon_3$ | 1     | 0     | 0     | 0     | 0     | 0     | 1     |

$$x_1 \leq \min\left\{\frac{\varepsilon_1}{0.5}, \frac{\varepsilon_2}{0.5}, \frac{1+\varepsilon_2}{1}\right\} = \min\{2\varepsilon_1, 2\varepsilon_2, 1 + \varepsilon_3\} = 2\varepsilon_2$$

$$x_1 \leftrightarrow w_2.$$

### 1. iteracija:

| baza  | b                                    | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| -z    | $-20\varepsilon_2$                   | 0     | -27   | 1     | -44   | 0     | -20   | 0     |
| $w_1$ | $\varepsilon_1 - \varepsilon_2$      | 0     | -4    | -2    | 8     | 1     | -1    | 0     |
| $x_1$ | $2\varepsilon_2$                     | 1     | -3    | -1    | 2     | 0     | 2     | 0     |
| $w_3$ | $1 + \varepsilon_3 - 2\varepsilon_2$ | 0     | 3     | 1     | -2    | 0     | -2    | 1     |

$$x_3 \leq \min\left\{\frac{1+\varepsilon_3-2\varepsilon_2}{1}\right\} = 1 + \varepsilon_3 - 2\varepsilon_2$$

$$x_3 \leftrightarrow w_3.$$

### 2. iteracija:

| baza  | b                                                     | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $w_1$ | $w_2$ | $w_3$ |
|-------|-------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| -z    | $-1 - 18\varepsilon_2 - \varepsilon_3$                | 0     | -30   | 0     | -42   | 0     | -18   | -1    |
| $w_1$ | $2 + \varepsilon_1 - 5\varepsilon_2 + 2\varepsilon_3$ | 0     | 2     | 0     | 4     | 1     | -5    | 2     |
| $x_1$ | $1 + \varepsilon_3$                                   | 1     | 0     | 0     | 0     | 0     | 0     | 1     |
| $x_3$ | $1 + \varepsilon_3 - 2\varepsilon_2$                  | 0     | 3     | 1     | -2    | 0     | -2    | 1     |

$$z = 1 - 30x_2 - 42x_4 - 18w_2 - w_3$$

$$w_1 = 2 - 2x_2 - 4x_4 + 5w_2 - 2w_3$$

$$x_1 = 1 - w_3$$

$$x_3 = 1 - 3x_2 + 2x_4 + 2w_2 - w_3$$

$$x_2 = x_4 = w_2 = w_3 = 0, \quad x_1 = x_3 = 1, w_1 = 2, \quad z = 1$$