Töövihik. LVS-i lahendamine Crameri reegliga

1. Süsteemist $\begin{cases} x+3y=-1 \\ 2x-4y=3 \end{cases}$ kirjutada välja determinandid D, D_x ja D_y ning arvutada.

Lahendus.

$$D = \begin{vmatrix} & \\ & \end{vmatrix} = \_\_\_\_\_$$

$$D_x = \begin{vmatrix} -1 & \\ 3 & \end{vmatrix} = \_\_\_\_\_ \qquad D_y = \begin{vmatrix} & -1 \\ & 3 \end{vmatrix} = \_\_\_\_\_$$

2. On antud süsteem $\begin{cases} 2x+5y=-6 \\ -4x+2y=1 \end{cases}$. Leia vastava determinandi vale kiri

a) $D_x = \begin{vmatrix} -6 & 5 \\ 1 & 2 \end{vmatrix}$ b) $D = \begin{vmatrix} 2 & 5 \\ -4 & 2 \end{vmatrix}$ c) $D_y = \begin{vmatrix} 5 & -6 \\ 2 & 1 \end{vmatrix}$.

3. Lahendada LVS $\begin{cases} 2u+3v=9 \\ 3u-4v=3 \end{cases}$

Lahendus.

$$D = \begin{vmatrix} \square & \square \\ \square & \square \end{vmatrix} = \_\_\_\_\_$$

$$D_u = \begin{vmatrix} \square & \square \\ \square & \square \end{vmatrix} = \_\_\_\_\_ \qquad D_v = \begin{vmatrix} \square & \square \\ \square & \square \end{vmatrix} = \_\_\_\_\_$$

$$u = \frac{D_u}{D} = \frac{\square}{\square} = \quad , \quad v = \frac{D_v}{D} = \frac{\square}{\square} = \quad .$$

Kontroll.

Vastus: $u =$, $v =$.

4. Lahendada LVS $\begin{cases} x+4y-3z=2 \\ x-5y-3z=1 \\ -x+6y+4z=-1 \end{cases}$.

Lahendus.

$$D=\begin{vmatrix} 1 & 4 & -3 \\ 1 & -5 & -3 \\ -1 & 6 & 4 \end{vmatrix} \quad =$$

(*Leida determinandi väärtus Sarruse reegliga*)

$$D_x=\begin{vmatrix} \square & 4 & -3 \\ \square & -5 & -3 \\ \square & 6 & 4 \end{vmatrix} =$$

(*Leida determinandi väärtus arendades* 1. *rea järgi*)

$$D_y=\begin{vmatrix} 1 & \square & -3 \\ 1 & \square & -3 \\ -1 & \square & 4 \end{vmatrix} =$$

(*Leida determinandi väärtus arendades* 1. *veeru järgi*)

$$D_z=\begin{vmatrix} 1 & 4 & \square \\ 1 & -5 & \square \\ -1 & 6 & \square \end{vmatrix} =$$

(*Leida determinandi väärtus teisendades* 1. *veeru elemendid peale* a_{11} *nullideks*)

$x = \frac{D_x}{D} = \frac{\square}{\square} =$, $y = \frac{D_y}{D} = \frac{\square}{\square} =$, $z = \frac{D_z}{D} = \frac{\square}{\square} =$.

Kontroll.

Vastus: $x =$, $y =$, $z =$.

5. Lahendada LVS $\begin{cases} 3x_1 - x_2 + 2x_3 = -2 \\ x_1 + 4x_2 - 3x_3 = -5 \\ 2x_1 + 2x_2 + x_3 = 4 \end{cases}$.

Lahendus.

$D = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$

$D_{x_1} = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$

$D_{x_2} = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$

$D_{x_3} = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$

$$x_1 = \frac{D_{x_1}}{D} = \frac{\square}{\square} = \quad , \qquad x_2 = \frac{D_{x_2}}{D} = \frac{\square}{\square} = \quad , \qquad x_3 = \frac{D_{x_3}}{D} = \frac{\square}{\square} = \quad .$$

Kontroll.

Vastus: $x_1 =$, $x_2 =$, $x_3 =$.

6*. Lahendada LVS $\begin{cases} x_1 + 2x_2 + 3x_3 = 2 \\ 4x_1 + 5x_2 + 6x_3 = 1. \\ 7x_1 + 8x_2 + 9x_3 = -1 \end{cases}$

Lahendus.

$$D = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$$

$$D_{x_1} = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$$

$$D_{x_2} = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$$

$$D_{x_3} = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$$

Vastus:

7*. Lahendada LVS $\begin{cases} x+y-3z &= 1 \\ 2x-y &= -1. \\ -x+2y-3z &= 2 \end{cases}$

Lahendus.

$D = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$

$D_x = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$

$D_y = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$

$D_z = \begin{vmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{vmatrix} =$

Vastus:

Ülesanded. Lahendada võrrandisüsteemid kasutades Crameri valemeid

1. $\begin{cases} 2x+y=5 \\ 7x-2y=12 \end{cases}$. **2.** $\begin{cases} 3x+y=-5 \\ 2x+6y=-18 \end{cases}$ **3.** $\begin{cases} 4x+y+z &= 1 \\ x-2y-z &= -5. \\ 6x+y+z &= 1 \end{cases}$

4. $\begin{cases} 6x_1+x_2+x_3 &= 7 \\ x_1+6x_2+x_3 &= 3 \\ x_1+x_2+6x_3 &= 1 \end{cases}$. **5.** $\begin{cases} x_1-2x_2+2x_3-4x_4 = 2 \\ -2x_1+3x_2-4x_3+6x_4 = -1 \\ 3x_1-6x_2+5x_3-10x_4 = -2 \\ -6x_1+9x_2-10x_3+15x_4 = 3 \end{cases}$.

6. $\begin{cases} 3x_1 - 8x_2 + 3x_3 + 5x_4 = 1 \\ x_1 - 14x_2 - x_4 = 2 \\ 4x_1 - 57x_2 + x_3 - 4x_4 = 4 \\ 5x_1 - 10x_2 + 5x_3 + 9x_4 = 2 \end{cases}$ **7*.** $\begin{cases} -x + 2y - 3z = 3 \\ 2x - y = 1 \\ -x + z = 1 \end{cases}$ **8*.** $\begin{cases} 3x - y + 2z = 5 \\ 2x + y - 2z = 4 \\ -x + 2y - 4z = 1 \end{cases}$

Vastused.

1. $x = 2,\ y = 1.$ **2.** $x = -3,\ y = 4.$ **3.** $x = 0,\ y = 4,\ z = -3.$ **4.** $x_1 = \frac{9}{8},\ x_2 = \frac{13}{40},$ $x_3 = -\frac{3}{40}.$ **5.** $x_1 = 20,\ x_2 = 17,\ x_3 = -12,\ x_4 = -10.$ **6.** $x_1 = -\frac{13}{2},\ x_2 = -1,$ $x_3 = -5,\ x_4 = \frac{11}{2}.$ **7*.** Pole lahenduv. **8*.** Lõpmata palju lahendeid.