

2. mājasdarbs – Gausa metode, determinanti

Lekcijā mācīja determinantus, kā tie veidojas, kā tos risināt. Tika pieminēta arī Kramera formula, kā tā atšķiras ar citām formulām, kādas darbības jāveic lai tiktu pie determinantiem, x un y vērtībām. Tika rādīti risinājumi pirmās, otrās un trešās kārtās determinantiem. Parādīts, kā darboties ar n lieluma matricām.

1) Parādot katru risinājuma soli, atrisiniet ar Gausa metodi šādu vienādojumu sistēmu:

$$\{y+3z+8u=4, x+u=3, 2y+z+10u=5, -2x+y-2z=-1\}.$$

2. mājasdarbs

$$\begin{pmatrix} 0 & 1 & 3 & 8 & 4 \\ 1 & 0 & 0 & 1 & 3 \\ 0 & 2 & 1 & 10 & 5 \\ -2 & 1 & -2 & 0 & -1 \end{pmatrix} \xrightarrow{R_2 \leftrightarrow R_1} \begin{pmatrix} 1 & 0 & 0 & 1 & 3 \\ 0 & 1 & 3 & 8 & 4 \\ 0 & 2 & 1 & 10 & 5 \\ -2 & 1 & -2 & 0 & -1 \end{pmatrix} \xrightarrow{R_4 + 2R_1} \begin{pmatrix} 1 & 0 & 0 & 1 & 3 \\ 0 & 1 & 3 & 8 & 4 \\ 0 & 2 & 1 & 10 & 5 \\ 0 & 1 & -2 & 2 & 5 \end{pmatrix}$$

$$\xrightarrow{R_3 - 2R_2} \begin{pmatrix} 1 & 0 & 0 & 1 & 3 \\ 0 & 1 & 3 & 8 & 4 \\ 0 & -5 & -5 & -6 & -3 \\ 0 & 1 & -2 & 2 & 5 \end{pmatrix} \xrightarrow{R_4 - R_2} \begin{pmatrix} 1 & 0 & 0 & 1 & 3 \\ 0 & 1 & 3 & 8 & 4 \\ 0 & -5 & -5 & -6 & -3 \\ 0 & 0 & -5 & -6 & 1 \end{pmatrix}$$

$$\xrightarrow{R_4 - R_3} \begin{pmatrix} 1 & 0 & 0 & 1 & 3 \\ 0 & 1 & 3 & 8 & 4 \\ 0 & -5 & -5 & -6 & -3 \\ 0 & 0 & 0 & 4 & 4 \end{pmatrix} \xrightarrow{R_4 : 4} \begin{pmatrix} 1 & 0 & 0 & 1 & 3 \\ 0 & 1 & 3 & 8 & 4 \\ 0 & -5 & -5 & -6 & -3 \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$

4. vienādojum
aplūk, sistēmai
nav viena risinājuma

Rezultātu pārbaudiet ar WolframAlpha.

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{y+3z+8u=4, x+u=3, 2y+z+10u=5, -2x+y-2z=-1}

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Input

{y + 3z + 8u = 4, x + u = 3, 2y + z + 10u = 5, -2x + y - 2z = -1}

Result

{8u + y + 3z = 4, u + x = 3, 10u + 2y + z = 5, -2x + y - 2z = -1}

Alternate forms

{8u + y + 3z = 4, u + x = 3, 10u + 2y + z = 5, y + 1 = 2(x + z)}

{z = -\frac{8u}{3} - \frac{y}{3} + \frac{4}{3}, x = 3 - u, z = -10u - 2y + 5, z = -x + \frac{y}{2} + \frac{1}{2}}

Solutions

(no solutions exist)

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2) Atrisiniet vienādojumu sistēmu, $\{13x-15y=1, -6x+7y=1\}$, izmantojot Kramera formulas.

Handwritten solution for the system of linear equations using Cramer's rule:

$$\textcircled{2} \quad \begin{array}{cc|c} 13 & -15 & 1 \\ -6 & 7 & 1 \end{array}$$

$$d = \begin{vmatrix} 13 & -15 \\ -6 & 7 \end{vmatrix} = (13 \cdot 7) - (-15 \cdot (-6)) = 1$$

$$d_1 = \begin{vmatrix} 1 & -15 \\ 1 & 7 \end{vmatrix} = (1 \cdot 7) - (1 \cdot (-15)) = 22$$

$$d_2 = \begin{vmatrix} 13 & 1 \\ -6 & 1 \end{vmatrix} = (13 \cdot 1) - (-6 \cdot 1) = 19$$

$$x_1 = \frac{d_1}{d} = \frac{22}{1} = 22$$

$$y_2 = \frac{d_2}{d} = \frac{19}{1} = 19 //$$

3) Aprēķiniet determinantu $\text{Det}[\{2,5,1\}, \{1,2,4\}, \{4,3,1\}]$, izmantojot lekcijā doto 3×3 determinanta definīciju (ne savādāk). Parādiet katru aprēķina soli.

Handwritten calculation of the 3×3 determinant using cofactor expansion:

$$\textcircled{3} \quad \det \begin{vmatrix} 2 & 5 & 1 \\ 1 & 2 & 4 \\ 4 & 3 & 1 \end{vmatrix} = -20 + 75 - 5 = 50$$

$$1 \begin{vmatrix} 1 & 2 \\ 4 & 3 \end{vmatrix} = 1 \cdot ((1 \cdot 3) - (2 \cdot 4)) = -5$$


$$-5 \begin{vmatrix} 1 & 4 \\ 4 & 1 \end{vmatrix} = -5 ((1 \cdot 1) - (4 \cdot 4)) = 75$$


$$2 \begin{vmatrix} 2 & 4 \\ 3 & 1 \end{vmatrix} = 2 ((2 \cdot 1) - (4 \cdot 3)) = -20 //$$


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Input interpretation


$$\begin{vmatrix} 2 & 5 & 1 \\ 1 & 2 & 4 \\ 4 & 3 & 1 \end{vmatrix}$$

$|m|$ is the determinant

Result ☒ Step-by-step solution


50

Number line



Number name

fifty

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