

Тема

Звіт з ЛР 3. Маньківський В.В. ВТ-21-1[2]

Варіант 17
Завдання 1

Знайти $A^{-1}A$

$$1. \Delta_1 \begin{vmatrix} 3 & 1 & 0 \\ 4 & 3 & 2 \\ 2 & 2 & -7 \end{vmatrix} = 3 \begin{vmatrix} 3 & 2 \\ 2 & -7 \end{vmatrix} - 1 \begin{vmatrix} 4 & 2 \\ 2 & -7 \end{vmatrix} = 3 \cdot (-25) + 32 =$$

$$= -75 + 32 = -43 \neq 0$$

$$A_{11} = \begin{vmatrix} 3 & 2 \\ 2 & -7 \end{vmatrix} = -25 \quad A_{21} = - \begin{vmatrix} 1 & 0 \\ 2 & -7 \end{vmatrix} = +7 \quad A_{31} = \begin{vmatrix} 1 & 0 \\ 3 & 2 \end{vmatrix} = 2$$

$$A_{12} = \begin{vmatrix} 4 & 2 \\ 2 & -7 \end{vmatrix} = +32 \quad A_{22} = \begin{vmatrix} 3 & 0 \\ 2 & -7 \end{vmatrix} = -21 \quad A_{32} = - \begin{vmatrix} 3 & 0 \\ 4 & 2 \end{vmatrix} = -6$$

$$A_{13} = \begin{vmatrix} 4 & 3 \\ 2 & 2 \end{vmatrix} = 2 \quad A_{23} = - \begin{vmatrix} 3 & 1 \\ 2 & 2 \end{vmatrix} = 4 \quad A_{33} = \begin{vmatrix} 3 & 1 \\ 4 & 3 \end{vmatrix} = 5$$

$$A^{-1} = \frac{1}{\Delta_1} \begin{bmatrix} -25 & +7 & 2 \\ +32 & -21 & -6 \\ 2 & -4 & 5 \end{bmatrix}$$

$A^{-1}A$

$$A^{-1} \begin{bmatrix} \frac{25}{43} & -\frac{7}{43} & -\frac{2}{43} \\ -\frac{32}{43} & \frac{21}{43} & \frac{6}{43} \\ -\frac{2}{43} & \frac{4}{43} & -\frac{5}{43} \end{bmatrix} \cdot A \begin{bmatrix} 3 & 1 & 0 \\ 4 & 3 & 2 \\ 2 & 2 & -7 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

~~Задание 2~~

Задание 2

$$\begin{cases} -3x_1 + 5x_2 + 6x_3 = -8 \\ 3x_1 + x_2 + x_3 = -4 \\ x_1 - 4x_2 - 2x_3 = -9 \end{cases}$$

a)

$$A = \begin{bmatrix} -3 & 5 & 6 \\ 3 & 1 & 1 \\ 1 & -4 & -2 \end{bmatrix} \quad B = \begin{bmatrix} -8 \\ -4 \\ -9 \end{bmatrix} \quad X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

$$\Delta_1 = \begin{vmatrix} -3 & 5 & 6 \\ 3 & 1 & 1 \\ 1 & -4 & -2 \end{vmatrix} = \begin{vmatrix} -3 & 5 & 6 \\ 3 & 1 & 1 \\ 1 & -4 & -2 \end{vmatrix} = -3 \begin{vmatrix} 5 & 6 \\ -4 & -2 \end{vmatrix} + 1 \begin{vmatrix} -3 & 6 \\ 1 & -2 \end{vmatrix} =$$

$$-1 \begin{vmatrix} -3 & 5 \\ 1 & -4 \end{vmatrix} = -3 \cdot 14 - 7 = -42 - 7 = -49 \neq 0$$

$$\Delta_1 = \begin{vmatrix} -8 & 5 & 6 \\ -4 & 1 & 1 \\ -9 & -4 & -2 \end{vmatrix} = 4 \begin{vmatrix} 5 & 6 \\ -4 & -2 \end{vmatrix} + 1 \begin{vmatrix} -8 & 6 \\ -9 & -2 \end{vmatrix} - 1 \begin{vmatrix} -8 & 5 \\ -9 & -4 \end{vmatrix} =$$

$$= 56 + 70 - 77 = 49$$

$$\Delta_2 = \begin{vmatrix} -3 & -8 & 6 \\ 3 & -4 & 1 \\ 1 & -9 & -2 \end{vmatrix} = -3 \begin{vmatrix} -8 & 6 \\ -9 & -2 \end{vmatrix} - 4 \begin{vmatrix} -3 & 6 \\ 1 & -2 \end{vmatrix} - 1 \begin{vmatrix} -3 & -8 \\ 1 & -9 \end{vmatrix} =$$

$$= -3 \cdot 70 - 35 = -210 - 35 = -245$$

$$\Delta_3 = \begin{vmatrix} -3 & 5 & -8 \\ 3 & 1 & -4 \\ 1 & -4 & -9 \end{vmatrix} = -3 \begin{vmatrix} 5 & -8 \\ -4 & -9 \end{vmatrix} + 1 \begin{vmatrix} -3 & -8 \\ 1 & -9 \end{vmatrix} + 4 \begin{vmatrix} -3 & 5 \\ 1 & -4 \end{vmatrix} =$$

$$= 3 \cdot 77 + 35 + 28 = 231 + 63 = 294$$

$$x_1 = \frac{49}{-49} = -1$$

$$x_2 = \frac{-245}{-49} = 5$$

$$X = \begin{bmatrix} -1 \\ 5 \\ -6 \end{bmatrix}$$

$$x_3 = \frac{294}{-49} = -6$$

$$\begin{vmatrix} -3 & 6 \\ 1 & -2 \end{vmatrix} =$$

$$\begin{cases} 5 + 25 - 36 = -8 \\ -3 + 5 - 6 = -4 \\ -1 - 20 + 12 = -9 \end{cases}$$

$$d) A_{11} = + \begin{vmatrix} 1 & 1 \\ -4 & -2 \end{vmatrix} = +2 \quad A_{21} = - \begin{vmatrix} 5 & 6 \\ -4 & -2 \end{vmatrix} = -14 \quad A_{31} = + \begin{vmatrix} 5 & 6 \\ 1 & 1 \end{vmatrix} = 1$$

$$\begin{vmatrix} 5 & 6 \\ 1 & 1 \end{vmatrix} =$$

$$A_{12} = - \begin{vmatrix} 3 & 1 \\ 1 & -2 \end{vmatrix} = +7 \quad A_{22} = + \begin{vmatrix} -3 & 6 \\ 1 & -2 \end{vmatrix} = 0 \quad A_{32} = - \begin{vmatrix} -3 & 6 \\ 3 & 1 \end{vmatrix} = +21$$

$$A_{13} = + \begin{vmatrix} 3 & 1 \\ 1 & -4 \end{vmatrix} = -13 \quad A_{23} = - \begin{vmatrix} -3 & 5 \\ 1 & -4 \end{vmatrix} = -7 \quad A_{33} = + \begin{vmatrix} -3 & 5 \\ 3 & 1 \end{vmatrix} = -18$$

$$\begin{vmatrix} -8 \\ -9 \end{vmatrix} =$$

$$A^{-1} = \frac{1}{-49} \begin{bmatrix} +2 & -14 & -1 \\ +7 & 0 & +21 \\ -13 & -7 & -18 \end{bmatrix}$$

$$X = A^{-1} \cdot B$$

$$X = -\frac{1}{49} \begin{bmatrix} +2 & -14 & -1 \\ +7 & 0 & +21 \\ -13 & -7 & -18 \end{bmatrix} \times \begin{bmatrix} -8 \\ -4 \\ -9 \end{bmatrix} = \begin{bmatrix} -16 + 56 + 9 \\ -56 - 189 \\ +109 + 28 + 162 \end{bmatrix} \cdot \frac{-1}{49} =$$

$$= -\frac{1}{49} \begin{bmatrix} +49 \\ -245 \\ +299 \end{bmatrix}$$

$$X = \begin{bmatrix} -1 \\ 5 \\ -6 \end{bmatrix}$$

$$\begin{cases} 3 + 25 - 36 = -8 \\ -3 + 5 - 6 = -4 \\ -1 - 20 + 12 = -9 \end{cases}$$