

КОЗ №1
27 варіант

1A)
1) $A = \begin{pmatrix} 4 & 1 & 2 \\ 3 & 5 & -7 \end{pmatrix}$; $B = \begin{pmatrix} 3 & 0 & 1 \\ 2 & 3 & 4 \\ 1 & 1 & 1 \end{pmatrix}$
 $C = \begin{pmatrix} 10 & 2 & 5 \\ 1 & 3 & 6 \end{pmatrix}$

Знайти: $2C - 3AB^T$

1) $B^T = \begin{pmatrix} 3 & 2 & 1 \\ 0 & 3 & 1 \\ 1 & 4 & 1 \end{pmatrix}$

2) $3A = \begin{pmatrix} 12 & -3 & 6 \\ 9 & 15 & -21 \end{pmatrix}$

3) $3AB^T = \begin{pmatrix} 12 & -3 & 6 \\ 9 & 15 & -21 \end{pmatrix}_{2 \times 3} \cdot \begin{pmatrix} 3 & 2 & 1 \\ 0 & 3 & 1 \\ 1 & 4 & 1 \end{pmatrix}_{3 \times 3} =$

$$= \begin{bmatrix} 12 \cdot 3 + (-3) \cdot 0 + 6 \cdot 1 & 12 \cdot 2 + (-3) \cdot 3 + 6 \cdot 4 & 12 \cdot 1 + (-3) \cdot 1 + 6 \cdot 1 \\ 9 \cdot 3 + 0 \cdot 15 + (-21) \cdot 1 & 9 \cdot 2 + 15 \cdot 3 + (-21) \cdot 4 & 9 \cdot 1 + 15 \cdot 1 + (-21) \cdot 1 \end{bmatrix}$$

$$= \begin{pmatrix} 42 & 39 & -9 \\ 6 & -21 & -15 \end{pmatrix}$$

4) $2C = \begin{pmatrix} 20 & 4 & 10 \\ 2 & 6 & 12 \end{pmatrix}$

$$\Delta = \begin{vmatrix} 3 & 1 & -2 \\ 2 & 1 & 2 \\ 3 & 2 & -1 \end{vmatrix} = 3 \cdot 1 \cdot (-1) + (-1) \cdot 3 \cdot 2 + 2 \cdot 2 \cdot 2 = -3 - 6 + 8 = -1$$

$$\Delta = \begin{vmatrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{vmatrix} = 3 \cdot 2 \cdot 4 + 2 \cdot 3 \cdot 3 + 1 \cdot 2 \cdot 2 = 12 + 18 + 4 = 34$$

$$\Delta = \begin{vmatrix} 3 & -1 & 2 \\ 2 & 1 & 3 \\ 3 & 2 & 3 \end{vmatrix} = 3 \cdot 1 \cdot 3 + (-1) \cdot 2 \cdot 3 + 2 \cdot 2 \cdot 2 = 9 - 6 + 8 = 11$$

$$\Delta = \begin{vmatrix} 3 & -1 & 2 \\ 2 & 1 & 3 \\ 3 & 2 & 3 \end{vmatrix} = 3 \cdot 1 \cdot 3 + (-1) \cdot 2 \cdot 3 + 2 \cdot 2 \cdot 2 = 9 - 6 + 8 = 11$$

$$x_1 = \frac{A_1}{\Delta} = \frac{-1}{-1} = 1$$

$$x_2 = \frac{A_2}{\Delta} = \frac{34}{-1} = -34$$

$$x_3 = \frac{A_3}{\Delta} = \frac{11}{-1} = -11$$

Ergebnisse: $x_1 = 1, x_2 = -34, x_3 = -11$

2) Matrix Multiplikation

$$A_{12} = (-1)^{1+2} M_{12} = -1$$

$$M_{12} = \begin{vmatrix} 1 & 2 \\ 3 & 2 \end{vmatrix} = 1 \cdot 2 - 3 \cdot 3 = 2 - 9 = -7$$

$$A_{21} = (-1)^{2+1} M_{21} = -1$$

$$M_{21} = \begin{vmatrix} 3 & 1 \\ 3 & 2 \end{vmatrix} = 3 \cdot 2 - 3 \cdot 1 = 6 - 3 = 3$$

$$A_{22} = (-1)^{2+2} M_{22} = 1$$

$$M_{22} = \begin{vmatrix} 3 & 1 \\ 3 & 2 \end{vmatrix} = 3 \cdot 2 - 3 \cdot 1 = 6 - 3 = 3$$

$$A_{31} = (-1)^{3+1} M_{31} = 1$$

$$M_{31} = \begin{vmatrix} 1 & 2 \\ 1 & 2 \end{vmatrix} = 1 \cdot 2 - 1 \cdot 2 = 2 - 2 = 0$$

$$A_{32} = (-1)^{3+2} M_{32} = -1$$

$$M_{32} = \begin{vmatrix} 3 & 1 \\ 2 & 2 \end{vmatrix} = 3 \cdot 2 - 2 \cdot 2 = 6 - 4 = 2$$

$$A_{33} = (-1)^{3+3} M_{33} = 1$$

$$M_{33} = \begin{vmatrix} 3 & 1 \\ 2 & 2 \end{vmatrix} = 3 \cdot 2 - 2 \cdot 2 = 6 - 4 = 2$$

$$A^{-1} = \frac{C^T}{\det A} = \begin{pmatrix} 1 & -1 & 1 \\ -7 & 3 & 2 \\ 0 & 2 & 2 \end{pmatrix}$$

$$X = A^{-1} \cdot B = \begin{pmatrix} 1 & 1 & 0 \\ -\frac{6}{5} & -\frac{8}{5} & \frac{2}{5} \\ \frac{7}{5} & \frac{9}{5} & -\frac{1}{5} \end{pmatrix} \cdot \begin{pmatrix} -2 \\ 3 \\ 3 \end{pmatrix} =$$

$$= \begin{pmatrix} 1 \cdot (-2) + 1 \cdot 3 + 0 \cdot 3 \\ \left(-\frac{6}{5}\right) \cdot (-2) + \left(-\frac{8}{5}\right) \cdot 3 + \frac{2}{5} \cdot 3 \\ \frac{7}{5} \cdot (-2) + \frac{9}{5} \cdot 3 + \left(-\frac{1}{5}\right) \cdot 3 \end{pmatrix} = \begin{pmatrix} -2 + 3 + 0 \\ \frac{12}{5} - \frac{24}{5} + \frac{6}{5} \\ -\frac{14}{5} + \frac{27}{5} - \frac{3}{5} \end{pmatrix} =$$

$$= \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}$$

Signifikanz:

$$\begin{cases} x_1 = 1 \\ x_2 = 1 \\ x_3 = 2 \end{cases}$$

Мероприятий