и

$$\Delta\ A\left(x^{(1)}\ x^{(2)}\ x^{(3)}\right) = \left(E^{(1)}\ E^{(2)}\ E^{(3)}\right)$$

$$x_1^{(1)} = \frac{\det\left(E^{(1)}, A^{(2)}, A^{(3)}\right)}{\det A} = \frac{M_{11}}{\det A} = \frac{A_{11}}{\det A}$$

$$x_2^{(1)} = \frac{\det\left(A^{(1)}, E^{(1)}, A^{(3)}\right)}{\det A} = \frac{-M_{12}}{\det A} = \frac{A_{12}}{\det A}$$

$$x_3^{(1)} = \frac{\det\left(A^{(1)}, A^{(2)}, E^{(1)}\right)}{\det A} = \frac{M_{13}}{\det A} = \frac{A_{13}}{\det A}$$

$$x_1^{(2)} = \frac{\det\left(E^{(2)}, A^{(2)}, A^{(3)}\right)}{\det A} = \frac{-M_{21}}{\det A} = \frac{A_{21}}{\det A}$$

$$x_2^{(2)} = \frac{\det\left(A^{(1)}, E^{(2)}, A^{(3)}\right)}{\det A} = \frac{M_{22}}{\det A} = \frac{A_{22}}{\det A}$$

$$x_3^{(2)} = \frac{\det\left(A^{(1)}, A^{(2)}, E^{(2)}\right)}{\det A} = -\frac{M_{23}}{\det A} = \frac{A_{23}}{\det A}$$

$$x_1^{(3)} = \frac{\det\left(E^{(3)}, A^{(2)}, A^{(3)}\right)}{\det A} = \frac{M_{31}}{\det A} = \frac{A_{31}}{\det A}$$

$$x_2^{(3)} = \frac{\det\left(A^{(1)}, E^{(3)}, A^{(3)}\right)}{\det A} = -\frac{M_{32}}{\det A} = \frac{A_{32}}{\det A}$$

$$x_3^{(3)} = \frac{\det\left(A^{(1)}, A^{(2)}, E^{(3)}\right)}{\det A} = \frac{M_{33}}{\det A} = \frac{A_{33}}{\det A}$$

$\left(x^{(1)}\ x^{(2)}\ x^{(3)}\right) = = A^{-1}$ по определению

$$A^{-1} = \frac{1}{\det A} \cdot \begin{pmatrix} A_{11} & A_{21} & A_{31} \\ A_{12} & A_{22} & A_{32} \\ A_{13} & A_{23} & A_{33} \end{pmatrix}$$

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$$\begin{cases} 5x_1 + 8x_2 + x_3 = 2 \\ 3x_1 - 2x_2 + 6x_3 = -7 \\ 2x_1 + x_2 - x_3 = -5 \end{cases} \qquad \left(\begin{array}{ccc|c} 5 & 8 & 1 & 2 \\ 3 & -2 & 6 & -7 \\ 2 & 1 & -1 & -5 \end{array}\right)$$

$$\Delta = \begin{vmatrix} 5 & 8 & 1 \\ 3 & -2 & 6 \\ 2 & 1 & -1 \end{vmatrix} = \begin{vmatrix} 5 & 8 & 9 \\ 3 & -2 & 4 \\ 2 & 1 & 0 \end{vmatrix} = \begin{vmatrix} -11 & 8 & 9 \\ 7 & -2 & 4 \\ 0 & 1 & 0 \end{vmatrix} = -\begin{vmatrix} -11 & 9 \\ 7 & 4 \end{vmatrix} = -107$$

$$\Delta_1 = \begin{vmatrix} 2 & 8 & 1 \\ -7 & -2 & 6 \\ -5 & 1 & -1 \end{vmatrix} = \begin{vmatrix} 2 & 8 & 9 \\ -7 & -2 & 4 \\ -5 & 1 & 0 \end{vmatrix} = \begin{vmatrix} 42 & 8 & 9 \\ -17 & -2 & 4 \\ 0 & 1 & 0 \end{vmatrix} = -\begin{vmatrix} 42 & 9 \\ -17 & 4 \end{vmatrix} = -321$$

$$\Delta_2 = \begin{vmatrix} 5 & 2 & 1 \\ 3 & -7 & 6 \\ 2 & -5 & -1 \end{vmatrix} = \begin{vmatrix} 6 & 2 & 1 \\ 9 & -7 & 6 \\ 1 & -5 & -1 \end{vmatrix} = \begin{vmatrix} 6 & -3 & 1 \\ 9 & -37 & 6 \\ 1 & 0 & -1 \end{vmatrix} = \begin{vmatrix} 6 & -3 & 7 \\ 9 & -37 & 15 \\ 1 & 0 & 0 \end{vmatrix} = \begin{vmatrix} -3 & 7 \\ -37 & 15 \end{vmatrix} = 214$$

$$\Delta_3 = \begin{vmatrix} 5 & 8 & 2 \\ 3 & -2 & -7 \\ 2 & 1 & -5 \end{vmatrix} = \begin{vmatrix} -11 & 8 & 2 \\ 7 & -2 & -7 \\ 0 & 1 & -5 \end{vmatrix} = \begin{vmatrix} -11 & 8 & 42 \\ 7 & -2 & -17 \\ 0 & 1 & 0 \end{vmatrix} = -\begin{vmatrix} -11 & 42 \\ 7 & -17 \end{vmatrix} = 107$$

$$\begin{cases} x_1 = 3 \\ x_2 = -2 \\ x_3 = -1 \end{cases} \qquad A^* = \begin{pmatrix} -4 & 9 & 50 \\ 15 & -7 & -27 \\ 7 & 11 & -34 \end{pmatrix} \qquad A^{-1} = \frac{1}{\Delta} \cdot A^* = \begin{pmatrix} -\frac{4}{107} & \frac{9}{107} & \frac{50}{107} \\ \frac{15}{107} & -\frac{7}{107} & -\frac{27}{107} \\ \frac{7}{107} & \frac{11}{107} & -\frac{34}{107} \end{pmatrix}$$

$$A \cdot A^{-1} = \begin{pmatrix} 5 & 8 & 1 \\ 3 & -2 & 6 \\ 2 & 1 & -1 \end{pmatrix} \cdot \begin{pmatrix} -\frac{4}{107} & \frac{9}{107} & \frac{50}{107} \\ \frac{15}{107} & -\frac{7}{107} & -\frac{27}{107} \\ \frac{7}{107} & \frac{11}{107} & -\frac{34}{107} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{cases} 2x_1 - 3x_2 + x_3 = -7 \\ x_1 + 4x_2 + 2x_3 = -1 \\ x_1 - 4x_2 + 0x_3 = -5 \end{cases} \qquad \left(\begin{array}{ccc|c} 2 & -3 & 1 & -7 \\ 1 & 4 & 2 & -1 \\ 1 & -4 & 0 & -5 \end{array}\right)$$

$$\Delta = \begin{vmatrix} 2 & -3 & 1 \\ 1 & 4 & 2 \\ 1 & -4 & 0 \end{vmatrix} = \begin{vmatrix} 2 & 5 & 1 \\ 1 & 8 & 2 \\ 1 & 0 & 0 \end{vmatrix} = \begin{vmatrix} 5 & 1 \\ 8 & 2 \end{vmatrix} = 2$$

$$\Delta_1 = \begin{vmatrix} -7 & -3 & 1 \\ -1 & 4 & 2 \\ -5 & -4 & 0 \end{vmatrix} = \begin{vmatrix} -7 & -3 & 1 \\ 13 & 10 & 0 \\ -5 & -4 & 0 \end{vmatrix} = \begin{vmatrix} 13 & 10 \\ -5 & -4 \end{vmatrix} = -2$$

$$\Delta_2 = \begin{vmatrix} 2 & -7 & 1 \\ 1 & -1 & 2 \\ 1 & -5 & 0 \end{vmatrix} = \begin{vmatrix} 2 & -7 & 1 \\ -3 & 13 & 0 \\ 1 & -5 & 0 \end{vmatrix} = \begin{vmatrix} -3 & 13 \\ 1 & -5 \end{vmatrix} = 2$$

$$\Delta_3 = \begin{vmatrix} 2 & -3 & -7 \\ 1 & 4 & -1 \\ 1 & -4 & -5 \end{vmatrix} = \begin{vmatrix} 0 & 5 & 3 \\ 1 & 4 & -1 \\ 0 & -8 & -4 \end{vmatrix} = -\begin{vmatrix} 5 & 3 \\ -8 & -4 \end{vmatrix} = -4$$

$$\begin{cases} x_1 = -1 \\ x_2 = 1 \\ x_3 = -2 \end{cases} \qquad A^* = \begin{pmatrix} 8 & -4 & -10 \\ 2 & -1 & -3 \\ -8 & 5 & 11 \end{pmatrix} \qquad A^{-1} = \begin{pmatrix} 4 & -2 & -5 \\ 1 & -\frac{1}{2} & -\frac{3}{2} \\ -4 & \frac{5}{2} & \frac{11}{2} \end{pmatrix}$$

$$A \cdot A^{-1} = \begin{pmatrix} 2 & -3 & 1 \\ 1 & 4 & 2 \\ 1 & -4 & 0 \end{pmatrix} \cdot \begin{pmatrix} 4 & -2 & -5 \\ 1 & -\frac{1}{2} & -\frac{3}{2} \\ -4 & \frac{5}{2} & \frac{11}{2} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} 3 & -1 & 3 & 2 & 5 \\ 5 & -3 & 2 & 3 & 4 \\ 1 & -3 & -5 & 0 & -7 \\ 7 & -5 & 1 & 4 & 1 \end{pmatrix}$$

$$\begin{vmatrix} 3 & -1 \\ 5 & -3 \end{vmatrix} = -4 \qquad \begin{vmatrix} 3 & -1 & 3 \\ 5 & -3 & 2 \\ 1 & -3 & -5 \end{vmatrix} = 0$$

$$\begin{vmatrix} 3 & -1 & 2 \\ 5 & -3 & 3 \\ 1 & -3 & 0 \end{vmatrix} = 0 \qquad \begin{vmatrix} 3 & -1 & 5 \\ 5 & -3 & 4 \\ 1 & -3 & -7 \end{vmatrix} = 0$$

$$\begin{vmatrix} 3 & -1 & 3 \\ 5 & -3 & 2 \\ 7 & -5 & 1 \end{vmatrix} = 0 \qquad \begin{vmatrix} 3 & -1 & 2 \\ 5 & -3 & 3 \\ 7 & -5 & 4 \end{vmatrix} = 0 \qquad \begin{vmatrix} 3 & -1 & 5 \\ 5 & -3 & 4 \\ 7 & -5 & 1 \end{vmatrix} = 8$$

$$\begin{vmatrix} 3 & -1 & 3 & 5 \\ 5 & -3 & 2 & 4 \\ 1 & -3 & -5 & -7 \\ 7 & -5 & 1 & 1 \end{vmatrix} = 0 \qquad \begin{vmatrix} 3 & -1 & 2 & 5 \\ 5 & -3 & 3 & 4 \\ 1 & -3 & 0 & -7 \\ 7 & -5 & 4 & 1 \end{vmatrix} = 0 \quad \Rightarrow$$

$\Rightarrow$ rang $= 3$

Ответ: 3