

Контрольная работа №1

№1

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

$$\det A = 0 + 0 + 16 - (0 + 10 + 0) = 16 - 10 = 6$$

№2

$$x^4 + x^3 - 7x^2 - 13x - 6 \quad \cancel{= (x+2)(x^3-x^2-5x-3)} =$$

$$x_1 = -2$$

$$x_2 = -1$$

$$= (x+2)(x+1)(x^2-2x-3) =$$

$$= (x+2)(x+1)(x+1)(x-3)$$

$$\begin{array}{r|rrrrrr} 1 & 1 & -7 & -13 & -6 & \\ -2 & 1 & -1 & -8 & -5 & 34 \end{array}$$

$$\begin{array}{r|l} x^4 + x^3 - 7x^2 - 13x - 6 & x+2 \\ -x^4 + 2x^3 & \\ \hline -x^3 - 7x^2 - 13x - 6 & \\ -x^3 - 2x^2 & \\ \hline -5x^2 - 13x - 6 & \\ -5x^2 - 10x & \\ \hline -3x - 6 & \\ -3x - 6 & \\ \hline 0 & \end{array}$$

$$\begin{array}{r|l} x^3 - x^2 - 5x - 3 & x+1 \\ -x^3 + x^2 & \\ \hline -2x^2 - 5x - 3 & \\ -2x^2 - 2x & \\ \hline -3x - 3 & \\ -3x - 3 & \\ \hline 0 & \end{array}$$

№3

$$(1+8i - (9+5i))(9-10i - (27-5i)) - (9+5i)^2 =$$

$$= (1+8i - 9-5i)(9-10i-27+5i) - (9+5i)^2 = (-8+3i)(-18-5i) - (9+5i)^2 =$$

$$= 144 + 15 + 40i - 54i - 56 - 90i = 103 - 104i$$

N4

$$g(\cos(1.0\pi) + i\sin(1.0\pi)) = g(\cos\pi + i\sin\pi) = g(-1 + 0) = -9$$

N5

$$\begin{cases} \xi_1 + \xi_2 = -2 \\ \xi_2 - \xi_3 = 0 \\ -2\xi_1 - \xi_2 = 3 \end{cases}$$

$$A = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & -1 \\ -2 & -1 & 0 \end{pmatrix}$$

$$X = \begin{pmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \end{pmatrix}$$

$$B = \begin{pmatrix} -2 \\ 0 \\ 3 \end{pmatrix}$$

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

$$\det A \neq 0$$

$$A^{-1} = \frac{1}{\det A} \cdot A^*$$

$$1) \det A = 0 + 0 + 2 - (0 + 0 + 1) = 2 - 1 = 1$$

$$2) \begin{pmatrix} -1 & 2 & 2 \\ 0 & 0 & -1 \\ -1 & 1 & 1 \end{pmatrix}^T = \begin{pmatrix} -1 & 0 & -1 \\ 2 & 0 & 1 \\ 2 & -1 & 1 \end{pmatrix}$$

$$3) A^{-1} = \begin{pmatrix} -1 & 0 & -1 \\ 2 & 0 & 1 \\ 2 & -1 & 1 \end{pmatrix}$$

$$X = \begin{pmatrix} -1 & 0 & -1 \\ 2 & 0 & 1 \\ 2 & -1 & 1 \end{pmatrix} \begin{pmatrix} -2 \\ 0 \\ 3 \end{pmatrix} = \begin{pmatrix} -1 \\ -1 \\ -1 \end{pmatrix}$$

N6

$$\begin{array}{r|l} (x^5 + 2x^4 - 6x^3 - 8x^2 + 5x + 6) & (x^3 - 2x^2 - x + 2) \\ \hline x^5 - 2x^4 - x^3 + 2x^2 & \\ \hline 4x^4 - 5x^3 - 10x^2 + 5x + 6 & \\ 4x^4 - 8x^3 - 4x^2 + 8x & \\ \hline -3x^3 - 6x^2 - 3x + 6 & \\ 3x^3 - 6x^2 - 3x + 6 & \\ \hline & \end{array}$$

N7

$$A = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & -1 \\ -2 & -1 & 0 \end{pmatrix}$$

$$B = \begin{pmatrix} 1 & 0 & -2 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}$$

$$C = \begin{pmatrix} 1 & -2 & 1 \\ 1 & -1 & 1 \\ -2 & 4 & -1 \end{pmatrix}$$

$$D = -4A + 3B - 3C$$

$$-4A = \begin{pmatrix} -4 & -4 & 0 \\ 0 & -4 & 4 \\ 8 & 4 & 0 \end{pmatrix}$$

$$3B = \begin{pmatrix} 3 & 0 & -6 \\ 0 & 3 & -3 \\ 0 & 0 & 3 \end{pmatrix}$$

$$-3C = \begin{pmatrix} -3 & 6 & -3 \\ -3 & 3 & -3 \\ 6 & -12 & 3 \end{pmatrix}$$

$$-4A + 3B = \begin{pmatrix} -4 & -4 & 0 \\ 0 & -4 & 4 \\ 8 & 4 & 0 \end{pmatrix} + \begin{pmatrix} 3 & 0 & -6 \\ 0 & 3 & -3 \\ 0 & 0 & 3 \end{pmatrix} = \begin{pmatrix} -1 & -4 & -6 \\ 0 & -1 & 1 \\ 8 & 4 & 3 \end{pmatrix}$$

$$-4A + 3B - 3C = \begin{pmatrix} -1 & -4 & -6 \\ 0 & -1 & 1 \\ 8 & 4 & 3 \end{pmatrix} + \begin{pmatrix} -3 & 6 & -3 \\ -3 & 3 & -3 \\ 6 & -12 & 3 \end{pmatrix} = \begin{pmatrix} -4 & 2 & -9 \\ -3 & 2 & -2 \\ 14 & -8 & 6 \end{pmatrix}$$

N8

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

$$= \begin{pmatrix} 7 & -7 & 6 \\ -10 & 9 & -12 \\ -8 & 6 & -6 \end{pmatrix} \cdot \begin{pmatrix} 1 & -4 \\ 1 & 3 \\ -1 & 2 \end{pmatrix} = \begin{pmatrix} -6 & -37 \\ 2 & 79 \\ 4 & 38 \end{pmatrix}$$