

$$① \quad e_1 = (1 \ -2 \ 0 \ 1)$$

$$e_2 = (0 \ 1 \ 0 \ 1)$$

$$e_3 = (-1 \ 1 \ 1 \ 2)$$

$$\langle e_1, e_1 \rangle = 21$$

$$\langle e_1, e_2 \rangle = -6$$

$$\langle e_1, e_3 \rangle = -11$$

$$\langle e_2, e_2 \rangle = 2$$

$$\langle e_2, e_3 \rangle = 3$$

$$\langle e_3, e_3 \rangle = 7$$

$$G = \begin{pmatrix} 21 & -6 & -11 \\ -6 & 2 & 3 \\ -11 & 3 & 7 \end{pmatrix} = \gamma \rightarrow V = \sqrt{7} = 2.64$$

$$② \quad y_1 = x_1 = \begin{pmatrix} 1 \\ 0 \\ -2 \\ -4 \end{pmatrix}$$

$$y_2 = x_2 - \frac{(x_2, y_1)}{(y_1, y_1)} y_1 = \begin{pmatrix} -2 \\ 1 \\ 4 \\ 8 \end{pmatrix} - \frac{-42}{21} \begin{pmatrix} 1 \\ 0 \\ -2 \\ -4 \end{pmatrix} =$$

$$= \begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \end{pmatrix}$$

$$y_3 = x_3 - \frac{(x_3, y_2)}{(y_2, y_2)} y_2 - \frac{(x_3, y_1)}{(y_1, y_1)} y_1 =$$

$$= \begin{pmatrix} -1 \\ 0 \\ 3 \\ 5 \end{pmatrix} - 0 \cdot \begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \end{pmatrix} - \frac{-27}{21} \begin{pmatrix} 1 \\ 0 \\ -2 \\ -4 \end{pmatrix} =$$

$$= \begin{pmatrix} 2/7 \\ 0 \\ 3/7 \\ -1/7 \end{pmatrix}$$

$$③ \quad A = \begin{pmatrix} 4-\lambda & -8 & 8 \\ -14 & 13-\lambda & -16 \\ -14 & 17 & -20-\lambda \end{pmatrix}$$

$$\text{Миноры: } \begin{matrix} (11) \\ (12) \end{matrix} \begin{pmatrix} 13-\lambda & -16 \\ 17 & -20-\lambda \end{pmatrix} = -(13-\lambda)(20+\lambda) + 16 \cdot 17 =$$

$$= (\lambda+4)(\lambda+3)$$

$$(21) \begin{pmatrix} -8 & 8 \\ 17 & -20-\lambda \end{pmatrix} = 8(20+\lambda) - 8 \cdot 17 =$$

$$= 8 \cdot (3+\lambda)$$

$$\begin{pmatrix} -14 & -16 \\ -14 & -20-\lambda \end{pmatrix} = (20+\lambda)14 - 16 \cdot 14 =$$

$$= 14(\lambda+4)$$

... собственные значения не вычисляю.

$$(13) \begin{pmatrix} -14 & 13-\lambda \\ -14 & 17 \end{pmatrix} = -14 \cdot 17 + 14 \cdot (13-\lambda) =$$

$$= -14(\lambda+4)$$

НОД: все миноры $D_i = 1$

$$CP(\lambda) = \frac{(-1)^3 \cdot |A - \lambda E|}{D_2} = -1 \cdot (\lambda+3)(\lambda-4)(\lambda+4)$$

