

3)

$$A = \begin{pmatrix} 5 & 7 & -17 \\ 10 & -1 & -19 \\ 10 & 20 & 5 \end{pmatrix}$$

$$V_1 = \begin{pmatrix} 5 \\ 10 \\ 10 \end{pmatrix} + \begin{pmatrix} 15 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 20 \\ 10 \\ 10 \end{pmatrix}$$

$$Q_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} - \frac{2}{600} \begin{pmatrix} 20 \\ 10 \\ 10 \end{pmatrix} \begin{pmatrix} 20 & 10 & 10 \end{pmatrix}$$

$$\frac{1}{300} \begin{pmatrix} 400 & 200 & 200 \\ 200 & 100 & 100 \\ 200 & 100 & 100 \end{pmatrix}$$

$$Q_1 = \begin{pmatrix} -\frac{1}{3} & -\frac{2}{3} & -\frac{2}{3} \\ -\frac{2}{3} & \frac{2}{3} & \frac{1}{3} \\ -\frac{2}{3} & -\frac{1}{3} & \frac{2}{3} \end{pmatrix}$$

$$Q_1 \cdot A = \begin{pmatrix} -15 & -15 & 15 \\ 0 & -12 & -3 \\ 0 & 9 & 21 \end{pmatrix}$$

$$V_2 = \begin{pmatrix} -12 \\ 9 \end{pmatrix} - \begin{pmatrix} 15 \\ 0 \end{pmatrix} = \begin{pmatrix} -21 \\ 9 \end{pmatrix}$$

$$Q_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} - \frac{2}{810} \begin{pmatrix} -21 \\ 9 \end{pmatrix} \begin{pmatrix} -21 & 9 \end{pmatrix} = \begin{pmatrix} -\frac{4}{9} & \frac{3}{9} \\ \frac{3}{9} & \frac{4}{9} \end{pmatrix}$$

$$\frac{1}{405} \begin{pmatrix} 729 & -243 \\ -243 & 81 \end{pmatrix}$$

$$R = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -\frac{4}{9} & \frac{3}{9} \\ 0 & \frac{3}{9} & \frac{4}{9} \end{pmatrix} \begin{pmatrix} -15 & -15 & 15 \\ 0 & -12 & -3 \\ 0 & 9 & 21 \end{pmatrix} = \begin{pmatrix} -15 & -15 & 15 \\ 0 & 15 & 15 \\ 0 & 0 & 15 \end{pmatrix}$$

$$24) \quad v_1 = c_{11} \mp \|c_1\|_2 \cdot e_1 \quad \text{mit } "-" \text{ f\"ur } c_{11} < 0 \quad ; "+" \text{ f\"ur } c_{11} \geq 0$$

$$v_1 = c_{11} + \text{sign}(c_{11}) \|c_1\|_2$$

$$v_{11} = c_{11} - \underbrace{(-\text{sign}(c_{11}) \|c_1\|_2)}_{d} \quad \checkmark$$

$$v_{11} = c_{11} - d \quad \checkmark$$

$$\|v\|_2^2 = v_1^2 + a_2^2 + \dots + a_n^2$$

$$= (c_{11} - d)^2 + a_2^2 + \dots + a_n^2$$

$$= (c_{11}^2 - 2c_{11}d + d^2) + a_2^2 + \dots + a_n^2$$

$$= -2c_{11}d + d^2 + \|c_1\|_2^2$$

$$= -2c_{11}d + d^2 + (-\text{sign}(c_{11}) \|c_1\|_2)^2$$

$$= -2c_{11}d + d^2 + d^2$$

$$= -2c_{11}d + 2d^2$$

$$= -2d(c_{11} - d)$$

$$= \underline{\underline{-2dv_1}}$$