

Q/g

1466

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

$$K(\lambda) = \begin{pmatrix} 0-\lambda & 1 & 0 \\ -4 & 4-\lambda & 0 \\ -2 & 1 & 2-\lambda \end{pmatrix} \begin{matrix} \text{III} \\ \text{II} \\ \text{I} \end{matrix}$$

$$= -\lambda(-\lambda+4)(-\lambda+2) + 1(-2) + 4 - (-2)(-\lambda+4) \cdot 0 - 1 \cdot 0 \cdot (-\lambda) - (-\lambda)(-4) \cdot 1$$

$$= -\lambda^3 + 6\lambda^2 - 12\lambda + 8 = (\lambda-2)^3 = 0$$

$$\lambda = 2 \quad \text{mg. 3}$$

$$A - \lambda_1 E = A - 2E = \begin{pmatrix} -2 & 1 & 0 \\ -4 & 2 & 0 \\ -2 & 1 & 0 \end{pmatrix} \sim \begin{pmatrix} -2 & 1 & 0 \\ -4 & 2 & 0 \\ -2 & 1 & 0 \end{pmatrix}$$

$$C_1(1, 2, 0) + C_2(0, 0, 1), \quad C_1, C_2 \neq 0$$

$$1468 \begin{pmatrix} 1 & -3 & 3 \\ -2 & -6 & 13 \\ -1 & -4 & 8 \end{pmatrix}$$

$$K(\lambda) = \begin{pmatrix} 1-\lambda & -3 & 3 \\ -2 & -6-\lambda & 13 \\ -1 & -4 & 8-\lambda \end{pmatrix}$$

$$= (1-\lambda)(-6-\lambda)(8-\lambda) + (-3) \cdot 13 \cdot (-1) + 3 \cdot (-1) \cdot (-4) - 3 \cdot (-6-\lambda) \cdot (-1) - (-3)(-1)(8-\lambda) - (1-\lambda)(13) \cdot (-4) = 0$$

$$= -\lambda^3 + 3\lambda^2 - 3\lambda + 1 = (\lambda-1)^3 = 0$$

$$\lambda = 1$$

$$A - \lambda E = \begin{pmatrix} 0 & -3 & 3 \\ -2 & -7 & 13 \\ -1 & -4 & 7 \end{pmatrix} \xrightarrow{2\text{III}} \begin{pmatrix} 0 & -3 & 3 \\ 0 & 1 & -1 \\ -1 & -4 & 7 \end{pmatrix}$$

x_1	x_2	x_3
3	1	1

$$R_1(3, 1, 1) \quad R_3 \leftrightarrow R_2$$

$$(1469) \begin{pmatrix} 1 & -3 & 4 \\ 4 & -7 & 8 \\ 6 & -7 & 7 \end{pmatrix}$$

$$\chi(\lambda) = \begin{vmatrix} 1-\lambda & -3 & 4 \\ 4 & -7-\lambda & 8 \\ 6 & -7 & 7-\lambda \end{vmatrix} = (1-\lambda)(-7-\lambda)(7-\lambda) + (-3) \cdot 8 \cdot 6 + 4 \cdot 4 \cdot (-2) -$$

$$- 4 \cdot (-7-\lambda) \cdot 6 - (-3) \cdot 4 \cdot (7-\lambda) -$$

$$- (1-\lambda) \cdot 8 \cdot (-7) = -\lambda^3 + \lambda^2 + 5\lambda + 3 = 0$$

$$= \frac{\lambda^3 + \lambda^2 + 5\lambda + 3}{\lambda^3 - \lambda^2} \Bigg| \lambda + 1$$

$$\begin{array}{r} -2\lambda^2 + 5\lambda \\ -2\lambda^2 + 2\lambda \\ \hline 3\lambda + 3 \\ -3\lambda + 3 \\ \hline 0 \end{array}$$

$$(\lambda + 1)(-\lambda^2 + 2\lambda + 3) = 0$$

$$\lambda^2 - 2\lambda - 3 = 0$$

$$\lambda_1 = -1$$

$$\lambda_2 = 3$$

$$\lambda = -1$$

$$A - \lambda E = \begin{pmatrix} 2 & -3 & 4 \\ 4 & -6 & 8 \\ 6 & -7 & 8 \end{pmatrix} \sim \begin{pmatrix} 0 & 2 & -4 \\ 6 & -7 & 8 \end{pmatrix}$$

$$C(1, 2, 1)$$

$$\lambda = 3$$

$$A - \lambda E = \begin{pmatrix} -2 & -3 & 4 \\ 4 & -10 & 8 \\ 6 & -7 & 4 \end{pmatrix} \xrightarrow{+2I} \begin{pmatrix} -2 & -3 & 4 \\ 4 & -10 & 8 \\ 6 & -7 & 4 \end{pmatrix} \xrightarrow{+3I} \begin{pmatrix} -2 & -3 & 4 \\ 0 & -16 & 16 \\ 0 & -16 & 16 \end{pmatrix} \xrightarrow{+I} \begin{pmatrix} -2 & -3 & 4 \\ 0 & -16 & 16 \\ 0 & -16 & 16 \end{pmatrix}$$

$$C\left(\frac{1}{2}, 1, 1\right)$$

$$\text{Mat} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix}$$

$$v(\lambda) = \begin{pmatrix} 1-\lambda & 0 & 0 & 0 \\ 0 & 0-\lambda & 0 & 0 \\ 0 & 0 & 0-\lambda & 0 \\ 0 & 0 & 0 & 1-\lambda \end{pmatrix} \cdot \lambda^4 - 2\lambda^3 + \lambda = \lambda^4(\lambda^2 - 2\lambda + 1) = \lambda^4(\lambda - 1)^2$$

$$\lambda_1 = \lambda = 1$$

$$\lambda = 0$$

$$A - \lambda E = A - E = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix} \sim \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$c(0, 0, 0, 1)$$

$$\lambda = 0 \Rightarrow A - \lambda E = A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 \end{pmatrix} \sim \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$c(0, 1, 0, 0)$$

$$(1423) \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\chi(\lambda) = \begin{vmatrix} 1-\lambda & 0 & 0 & 0 \\ 0 & 0-\lambda & 0 & 0 \\ 1 & 0 & 0-\lambda & 0 \\ 0 & 0 & 0 & 1-\lambda \end{vmatrix} = \lambda^4 - 2\lambda^3 + \lambda^2 = \lambda^2(\lambda^2 - 2\lambda + 1) = \lambda^2(\lambda - 1)^2$$

$$\lambda_1 = 1$$

$$\lambda_2 = 0$$

$$A - \lambda_1 E_2 = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 1 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} \sim \begin{pmatrix} 1 & 0 & -1 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$c(1, 0, 1, 0), c \neq 0$$

$$\lambda_2 = 0$$

$$A - \lambda_2 E_4 = A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$c(0, 0, 1, 0), c \neq 0$$