

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$\det(A) = |A| = ad - bc$$

determinant

行列式

$$Ax = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} \frac{d}{ad-bc} \\ \frac{-c}{ad-bc} \end{bmatrix}$$

$$Ay = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$y = \frac{1}{ad-bc} \begin{bmatrix} d \\ -c \end{bmatrix}$$

$$\begin{vmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix} \quad |A|$$

|A|

$$\left[ \begin{array}{cc|cc} 1 & k & k & 0 \\ 0 & 1 & \frac{-c}{ad-bc} & \frac{a}{ad-bc} \end{array} \right]$$

$$AA^{-1} = A^{-1}A = I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$a = -a \Rightarrow a = 0$$

$$\begin{vmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{vmatrix} = \begin{vmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{vmatrix} \quad \text{or} \quad \begin{vmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{vmatrix} = 0$$

$$|A|$$

$$\det(A)$$

$$\begin{vmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{vmatrix}$$

$$\begin{vmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{vmatrix}$$

$$[A|I] \rightarrow [I|A]$$

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$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$$= a_{11}a_{22}a_{33} + a_{12}a_{23}a_{31} + a_{13}a_{21}a_{32} - a_{13}a_{22}a_{31} - a_{21}a_{12}a_{33} - a_{11}a_{23}a_{32}$$

$$= a_{11} \begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix} + a_{12} \begin{vmatrix} a_{23} & a_{21} \\ a_{33} & a_{31} \end{vmatrix} + a_{13} \begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$$

$$+ a_{21}(-1)^{2+1} \begin{vmatrix} a_{12} & a_{13} \\ a_{32} & a_{33} \end{vmatrix} + a_{22} \begin{vmatrix} a_{11} & a_{13} \\ a_{31} & a_{33} \end{vmatrix} + a_{23}(-1)^{2+3} \begin{vmatrix} a_{11} & a_{12} \\ a_{31} & a_{32} \end{vmatrix}$$

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \quad Ax = b, \quad x = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$\det(A) \equiv |A| = ad - bc \quad \begin{cases} ax + by = e \\ cx + dy = f \end{cases}$$

determinant 行列式

$$\boxed{d - \frac{cb}{a}} y = \frac{f - ce}{a}$$

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$|A| = ad - bc$$

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}, \quad |A| = a_{11}a_{22} - a_{12}a_{21} \begin{cases} = 0 \Rightarrow A \text{ is singular} \\ \neq 0 \Rightarrow A \text{ is non-singular} \end{cases}$$

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$$AA^{-1} = A^{-1}A = I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} A^{-1} = I$$

$$A A^{-1} = I$$

$$\begin{bmatrix} x & x & x \\ x & x & x \end{bmatrix} \begin{bmatrix} x \\ x \\ x \end{bmatrix} = \begin{bmatrix} * & * \\ * & * \end{bmatrix}$$

$$AB = A \begin{bmatrix} b_1 & b_2 & b_3 \\ \uparrow & \uparrow & \uparrow \\ 2 \times 1 & 2 \times 1 & 2 \times 1 \end{bmatrix} = [Ab_1 \quad Ab_2 \quad Ab_3]$$



$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$\det(A) = |A| = ad - bc$$

determinant

行列式

$$A\tilde{x} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$\tilde{x} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} \frac{d}{ad-bc} \\ \frac{-c}{ad-bc} \end{bmatrix}$$

$$A\tilde{y} = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} -c \\ d \end{bmatrix}$$

$$\tilde{y} = \frac{1}{ad-bc} \begin{bmatrix} -b \\ a \end{bmatrix}$$

$$y = \frac{af - ce}{ad - cb}, \quad ad - bc \neq 0$$

$$x = \frac{ed - bf}{ad - cb}$$

$= 0 \Rightarrow A$  is singular.

$\neq 0 \Rightarrow A$  is non-singular.

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} x & y \\ z & w \end{bmatrix}$$

$$= \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}, \quad ad-bc \neq 0$$

$$|A| \neq 0$$

$$AA^{-1} = A^{-1}A = I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$Ax = \underline{b}$$

$$|A| \neq 0 \Rightarrow A^{-1}Ax = A^{-1}b$$

$$Ix =$$

$$\tilde{x} = A^{-1}b$$

$$Ax = \underline{b} \quad A^{-1}$$

$$\begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{bmatrix}$$

$$[A|I] \rightarrow [I|A^{-1}]$$

$$x \neq 0 \quad \left[ \begin{array}{cc|cc} a & b & 1 & 0 \\ c & d & 0 & 1 \end{array} \right] \xrightarrow{R_1 \leftrightarrow R_2} \left[ \begin{array}{cc|cc} c & d & 0 & 1 \\ a & b & 1 & 0 \end{array} \right] \xrightarrow{R_1 + \frac{c}{d}R_2} \left[ \begin{array}{cc|cc} 1 & \frac{b}{d} & \frac{c}{d} & \frac{1}{d} \\ 0 & d - \frac{bc}{a} & -\frac{c}{a} & \frac{1}{a} \end{array} \right]$$

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