$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

$$= a_1 \begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} - a_2 \begin{vmatrix} b_1 & c_1 \\ b_3 & c_3 \end{vmatrix} + a_3 \begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix}$$

1列の展開

1行の展開

$$= \alpha \cdot \begin{vmatrix} \beta & 0 \\ \varepsilon & \gamma \end{vmatrix} - 0 \cdot * + 0 \cdot *$$

$$\begin{vmatrix} \alpha & 0 & 0 \\ \delta & \beta & 0 \\ \varphi & \varepsilon & \gamma \end{vmatrix} = \alpha \begin{vmatrix} \beta & 0 \\ \varepsilon & \gamma \end{vmatrix} - \delta \begin{vmatrix} 0 & 0 \\ \varepsilon & \gamma \end{vmatrix} + \varphi \begin{vmatrix} 0 & 0 \\ \varepsilon & \gamma \end{vmatrix}$$

$\begin{vmatrix} 0 & 0 \\ \varepsilon & \gamma \end{vmatrix} = 0$, 〃0

$\beta\ 0$

$$= \alpha\beta\gamma.$$

$\begin{vmatrix} d & e \\ 0 & c \end{vmatrix}$ $\begin{vmatrix} d & e \\ b & f \end{vmatrix}$

$$\begin{vmatrix} a & d & e \\ 0 & b & f \\ 0 & 0 & c \end{vmatrix} = a \begin{vmatrix} b & f \\ 0 & c \end{vmatrix} - 0 \cdot * + 0 \cdot *$$

$$= abc$$

$$\begin{vmatrix} x & a & b \\ 0 & z & y \\ 0 & w & u \end{vmatrix} = x \begin{vmatrix} z & y \\ w & u \end{vmatrix} - 0 \cdot * + 0 \cdot *$$

$$= x(zu - wy)$$

$$\begin{vmatrix} a & 1 & 1 \\ 1 & a & 1 \\ 1 & 1 & a \end{vmatrix} = a \begin{vmatrix} a & 1 \\ 1 & a \end{vmatrix} - 1 \begin{vmatrix} 1 & 1 \\ 1 & a \end{vmatrix} + 1 \begin{vmatrix} 1 & 1 \\ a & 1 \end{vmatrix}$$

$$= a(a^2 - 1) - (a-1) + (1-a)$$

$$= (a-1)\{a(a+1) - 1 - 1\}$$

$$= (a-1)(a^2 + a - 2)$$

$$= (a-1)^2(a+2)$$

$$\begin{vmatrix} a & 1 & 1 \\ 1 & a & 1 \\ 1 & 1 & a \end{vmatrix} = a \begin{vmatrix} a & 1 \\ 1 & a \end{vmatrix} - 1 \cdot \begin{vmatrix} 1 & 1 \\ 1 & a \end{vmatrix} + \begin{vmatrix} 1 & 1 \\ a & 1 \end{vmatrix}$$

$$= a(a^2-1) - (a-1) + (1-a)$$

$$= (a-1)\{a(a+1) - 1 - 1\}$$

$$= (a-1)(a^2+a-2)$$

$$= (a-1)(a-1)(a+2)$$

$$= (a-1)^2(a+2)$$

$$\left(\begin{array}{ccc|c} a & 1 & 1 & * \\ 1 & a & 1 & * \\ 1 & 1 & a & * \end{array}\right) \longrightarrow \cdots$$

$x \; y \; z$

実は

$$A = \begin{pmatrix} a & 1 & 1 \\ 1 & a & 1 \\ 1 & 1 & a \end{pmatrix} \text{ が正則}$$

$$\Longleftrightarrow |A| \neq 0$$

$$\Longleftrightarrow a \neq 1, -2.$$

$$A \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} * \\ * \\ * \end{pmatrix}$$

$$a \neq 1, -2 \quad \begin{pmatrix} x \\ y \\ z \end{pmatrix} = A^{-1} \begin{pmatrix} * \\ * \\ * \end{pmatrix}$$

n = 2 では
習っている.

$$\begin{vmatrix} x & 0 & a \\ y & 0 & b \\ z & 1 & c \end{vmatrix} = x\begin{vmatrix} 0 & b \\ 1 & c \end{vmatrix} - y\begin{vmatrix} 0 & a \\ 1 & c \end{vmatrix} + z\underbrace{\begin{vmatrix} 0 & a \\ 0 & b \end{vmatrix}}_{=0}$$

$$= x(-b) - y(-a)$$

$$= ay - bx.$$

$(2,3)$

$$= -0 \cdot \begin{vmatrix} y & b \\ z & c \end{vmatrix} + 0\begin{vmatrix} x & a \\ z & c \end{vmatrix} - 1\begin{vmatrix} x & a \\ y & b \end{vmatrix}$$

2列の展開

$$= -1\begin{vmatrix} x & a \\ y & b \end{vmatrix} = ay - bx.$$

$$\begin{vmatrix} x & y & z \\ 1 & 0 & 0 \\ a & b & c \end{vmatrix} = x\overbrace{\begin{vmatrix} 0 & 0 \\ b & c \end{vmatrix}}^{0} - 1\cdot\begin{vmatrix} y & z \\ b & c \end{vmatrix} + a\overbrace{\begin{vmatrix} y & z \\ 0 & 0 \end{vmatrix}}^{0}$$

$$= -(yc - zb)$$

$(2,1)$

2行の展開 $= -1\cdot\begin{vmatrix} y & z \\ b & c \end{vmatrix} + 0\begin{vmatrix} x & z \\ a & c \end{vmatrix} - 0\begin{vmatrix} x & y \\ a & b \end{vmatrix}$

$$= -1\cdot\begin{vmatrix} y & z \\ b & c \end{vmatrix} = -(yc - bz)$$

$n=3$

余因子展開

$$\begin{vmatrix} a_1 & \boxed{b_1} & \boxed{c_1} \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

odd ~~im~~impair
even pair

$$= a_1 \begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} - a_2 \begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix} + a_3 \begin{vmatrix} b_1 & c_1 \\ b_2 & c_2 \end{vmatrix}$$

$$= -b_1 \begin{vmatrix} a_2 & c_2 \\ a_3 & c_3 \end{vmatrix} + b_2 \begin{vmatrix} a_1 & c_1 \\ a_3 & c_3 \end{vmatrix} - b_3 \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}$$

$$= c_1 \begin{vmatrix} a_2 & b_2 \\ a_3 & b_3 \end{vmatrix} - c_2 \begin{vmatrix} a_1 & b_1 \\ a_3 & c_3 \end{vmatrix} + c_3 \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$$

注

$$\mathbb{R}^3 \xrightarrow{F} \mathbb{R}.$$

定数項がない1次式.

$$\vec{a} \longmapsto c_1 a_1 + c_2 a_2 + c_3 a_3$$

$$F(\lambda \vec{a} + \mu \vec{d}) = \lambda F(\vec{a}) + \mu F(\vec{d})$$

c_1, c_2, c_3 は定数.

Ⅰ 列に関する線形性.

$$\Big|\ \overset{1列}{\boxed{\lambda\vec{a}+\mu\vec{d}}}\ \ \vec{b}\ \ \vec{c}\ \Big| = \lambda\,|\vec{a}\ \vec{b}\ \vec{c}| + \mu\,|\vec{d}\ \vec{b}\ \vec{c}|$$

$$\Big|\ \vec{a}\ \ \underset{2列.}{\boxed{\lambda\vec{b}+\mu\vec{d}}}\ \ \vec{c}\ \Big| = \lambda\,|\vec{a}\ \vec{b}\ \vec{c}| + \mu\,|\vec{a}\ \vec{d}\ \vec{c}|$$

3列は省略.

Ⅱ 隣する2列が等しいと$=0$

$$|\vec{a}\ \ \vec{a}\ \ \boxed{\vec{c}}\,| = 0 \qquad \begin{vmatrix} a_1 & a_1 & c_1 \\ a_2 & a_2 & c_2 \\ a_3 & a_3 & c_3 \end{vmatrix}$$

$$= c_1 \overbrace{\begin{vmatrix} a_2 & a_2 \\ a_3 & a_3 \end{vmatrix}}^{=0} - c_2 \overbrace{\begin{vmatrix} a_1 & a_1 \\ a_3 & a_3 \end{vmatrix}}^{=0} + c_3 \overbrace{\begin{vmatrix} a_1 & a_1 \\ a_2 & a_2 \end{vmatrix}}^{=0}$$

3列の余因子展開

2×2

$$|\vec{a}\ \ \vec{a}| = 0$$

Ⅲ $$|I_3| = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix} = 1\cdot\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 1$$

正規性.

IV) 異なる2列を交換すると(−1)倍.

$$|\vec{a}\ \vec{b}\ \vec{c}| = -|\vec{c}\ \vec{b}\ \vec{a}|$$

1列と3列の交換

$n=2$ と同様. $|\vec{a}+\vec{c}\ \ \vec{b}\ \ \vec{a}+\vec{c}| = \cdots$

exactly in the same way...

2列で展開.

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = -b_1\begin{vmatrix} a_2 & c_2 \\ a_3 & c_3 \end{vmatrix} + b_2\begin{vmatrix} a_1 & c_1 \\ a_3 & c_3 \end{vmatrix} - b_3\begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}$$

$$= -\left(-b_1\begin{vmatrix} c_2 & a_2 \\ c_3 & c_3 \end{vmatrix} + b_2\begin{vmatrix} c_1 & a_1 \\ c_3 & a_3 \end{vmatrix} - b_3\begin{vmatrix} c_1 & a_1 \\ c_2 & c_2 \end{vmatrix}\right)$$

$$= -|\vec{c}\ \vec{b}\ \vec{a}|$$

V) $i \neq j$ i列のλ倍をj列に加えても不変

$$|\vec{a}\ \vec{b}\ \vec{c}| = |\vec{a}\ \ \vec{b}\ \ \vec{c}+\lambda\vec{a}|$$

何故なら.

$$\text{RHS} = |\vec{a}\ \vec{b}\ \vec{c}| + \lambda\underbrace{|\vec{a}\ \vec{b}\ \vec{a}|}_{=0}$$

$$= |\vec{a}\ \vec{b}\ \vec{c}| = \text{LHS}$$

$$|\vec{a}+\vec{c} \quad \vec{b} \quad \vec{a}+\vec{c}| = 0$$

$$= \overbrace{|\vec{a} \; \vec{b} \; \vec{a}|}^{0} + |\vec{a} \; \vec{b} \; \vec{c}| + |\vec{c} \; \vec{b} \; \vec{a}| + \underbrace{|\vec{c} \; \vec{b} \; \vec{c}|}_{0}$$

$$\leadsto |\vec{a} \; \vec{b} \; \vec{c}| = -|\vec{c} \; \vec{b} \; \vec{a}|$$

注) $n = 2$

$$|\vec{a} \; \vec{b}| = -|\vec{b} \; \vec{a}|$$

性VII $\quad |{}^tA| = |A| \qquad \left|\vec{a}\ \vec{b}\ \vec{c}\right| = \begin{vmatrix} {}^t\vec{a} \\ {}^t\vec{b} \\ {}^t\vec{c} \end{vmatrix}$

行 ⟷ 列 $\qquad \begin{vmatrix} \mathbf{a} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix} = \left| {}^t\mathbf{a}\ \ {}^t\mathbf{b}\ \ {}^t\mathbf{c} \right|$

I′ 各行の線形性より

$$\begin{vmatrix} \lambda\mathbf{a} + \mu\mathbf{d} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix} = \lambda \begin{vmatrix} \mathbf{a} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix} + \mu \begin{vmatrix} \mathbf{d} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix}$$

~~IV~~ VI

$$= \left| \underbrace{{}^t(\lambda\mathbf{a} + \mu\mathbf{d})}_{\lambda\,{}^t\mathbf{a} + \mu\,{}^t\mathbf{d}}\ \ {}^t\mathbf{b}\ \ {}^t\mathbf{c} \right|$$

列の線形性より

I

$$= \lambda \left| {}^t\mathbf{a}\ \ {}^t\mathbf{b}\ \ {}^t\mathbf{c} \right| + \mu \left| {}^t\mathbf{d}\ \ {}^t\mathbf{b}\ \ {}^t\mathbf{c} \right|$$

VI

$$= \lambda \begin{vmatrix} \mathbf{a} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix} + \mu \begin{vmatrix} \mathbf{d} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix}$$

II′ 異なる2行が等しいと $= 0$

$$\begin{vmatrix} \mathbf{a} \\ \mathbf{b} \\ \mathbf{a} \end{vmatrix} = 0$$

$$= \left| {}^t\mathbf{a}\ \ {}^t\mathbf{b}\ \ {}^t\mathbf{a} \right| = 0$$

by II

IV'

$$\begin{vmatrix} \mathbf{a} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix} = - \begin{vmatrix} \mathbf{b} \\ \mathbf{a} \\ \mathbf{c} \end{vmatrix}$$

$$= |{}^t\mathbf{a}\ {}^t\mathbf{b}\ {}^t\mathbf{c}|$$

$$= -|{}^t\mathbf{c}\ {}^t\mathbf{b}\ {}^t\mathbf{a}|$$

$$= - \begin{vmatrix} \mathbf{c} \\ \mathbf{b} \\ \mathbf{a} \end{vmatrix}$$

V <u>定理</u>. $i \neq j$　i行のλ倍をj行に加えても不変.

$$\begin{vmatrix} \mathbf{a} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix} = \begin{vmatrix} \mathbf{a} \\ \lambda\mathbf{a} + \mathbf{b} \\ \mathbf{c} \end{vmatrix}$$

2行について線形性

(右) $= \lambda \underbrace{\begin{vmatrix} \mathbf{a} \\ \mathbf{a} \\ \mathbf{c} \end{vmatrix}}_{= 0} + \begin{vmatrix} \mathbf{a} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix} = \begin{vmatrix} \mathbf{a} \\ \mathbf{b} \\ \mathbf{c} \end{vmatrix} =$ (左)

I'　　II'

---

determinant
le déterminant

$$\begin{vmatrix} a & 1 & 1 \\ 1 & a & 1 \\ 1 & 1 & a \end{vmatrix} = - \begin{vmatrix} 1 & 1 & a \\ 1 & a & 1 \\ a & 1 & 1 \end{vmatrix} = - \begin{vmatrix} 1 & 1 & a \\ 0 & a-1 & 1-a \\ 0 & 1-a & 1-a^2 \end{vmatrix}$$

$$= -1 \cdot \begin{vmatrix} a-1 & 1-a \\ 1-a & 1-a^2 \end{vmatrix} \qquad (a-1)\begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

$$= -(a-1)(1-a) \begin{vmatrix} 1 & 1 \\ -1 & 1+a \end{vmatrix}$$

$$= (a-1)^2 (a+2)$$

Vous pouvez me poser des question.

$$\begin{vmatrix} a & 1 & 1 \\ 1 & a & 1 \\ 1 & 1 & a \end{vmatrix} = -\begin{vmatrix} 1 & a & 1 \\ a & 1 & 1 \\ 1 & 1 & a \end{vmatrix}$$

$$= -\begin{vmatrix} 1 & a & 1 \\ 0 & 1-a^2 & 1-a \\ 0 & 1-a & a-1 \end{vmatrix} \qquad \begin{array}{l} 2r + = 1r \times (-a) \\ 3r + = 1r \times (-1) \end{array}$$

$$(1-a)\begin{pmatrix} 1+a \\ 1 \end{pmatrix} \qquad (1-a)\begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

$$= -\begin{vmatrix} 1-a^2 & 1-a \\ 1-a & a-1 \end{vmatrix}$$

$$= -(1-a)^2 \begin{vmatrix} 1+a & 1 \\ 1 & -1 \end{vmatrix}$$

$$= -(a-1)^2(-a-2)$$

$$= (a-1)^2(a+2)$$

$n = 2$ の場合

$$A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} = (\vec{a}_1 \ \vec{a}_2)$$

$$B = \begin{pmatrix} b_{11} & \boxed{b_{12}} \\ b_{21} & \boxed{b_{22}} \end{pmatrix} = (\vec{b}_1 \ \vec{b}_2)$$

$$|AB| = |A\vec{b}_1 \ \ A\vec{b}_2| \qquad \vec{e}_1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$\vec{b}_1 = b_{11}\vec{e}_1 + b_{21}\vec{e}_2 \qquad \vec{e}_2 = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$= |A(b_{11}\vec{e}_1 + b_{21}\vec{e}_2) \ \ A\vec{b}_2|$$

$$= b_{11}\,|\underbrace{A\vec{e}_1}_{= \vec{a}_1} \ A\vec{b}_2| + b_{21}\,|\underbrace{A\vec{e}_2}_{= \vec{a}_2} \ A\vec{b}_2|$$

$$\vec{b}_2 = b_{12}\vec{e}_1 + b_{22}\vec{e}_2$$

$$= b_{11}\,|\vec{a}_1 \ A(b_{12}\vec{e}_1 + b_{22}\vec{e}_2)|$$

$$+ b_{21}\,|\vec{a}_2 \ A(b_{12}\vec{e}_1 + b_{22}\vec{e}_2)|$$

$$= b_{11}b_{12}\,\boxed{|\vec{a}_1 \ \underbrace{A\vec{e}_1}_{= \vec{a}_1}|} + b_{11}b_{22}\,|\vec{a}_1 \ \underbrace{A\vec{e}_2}_{= \vec{a}_2}|$$

$$+ b_{21}b_{12}\,\boxed{|\vec{a}_2 \ \underbrace{A\vec{e}_1}_{= \vec{a}_1}|} + b_{21}b_{22}\,\boxed{|\vec{a}_2 \ \underbrace{A\vec{e}_2}_{= \vec{a}_2}|}$$

$0 =$

$-|\vec{a}_1 \ \vec{a}_2|$

$= 0$

$$= (b_{11}b_{22} - b_{12}b_{21})\,|\underbrace{\vec{a}_1 \ \vec{a}_2}_{= A}| = |B| \cdot |A|$$

逆行列の計算法

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{pmatrix}$$

$(A \mid I_3)$

$$= \left(\begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ 2 & 4 & 5 & 0 & 1 & 0 \\ 3 & 5 & 6 & 0 & 0 & 1 \end{array}\right) \longrightarrow \left(\begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & 0 & -1 & -2 & 1 & 0 \\ 0 & -1 & -3 & -3 & 0 & 1 \end{array}\right)$$

2r + = 1r × (−2)
3r + = 1r × (−3)

$$\begin{array}{rrrrrr} 2 & 4 & 5 & 0 & 1 & 0 \\ 2 & 4 & 6 & 2 & 0 & 0 \\ \hline \end{array} \qquad \begin{array}{rrrrrr} & 3 & 5 & 6 & 0 & 0 & 1 \\ - & 3 & 6 & 9 & 3 & 0 & 0 \\ \hline & & -1 & -3 & -3 & 0 & 1 \end{array}$$

$$\left(\begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & 1 & 3 & 3 & 0 & -1 \\ 0 & 0 & 1 & 2 & -1 & 0 \end{array}\right) \longrightarrow \left(\begin{array}{ccc|ccc} 1 & 0 & -3 & -5 & 0 & 2 \\ 0 & 1 & 3 & 3 & 0 & -1 \\ 0 & 0 & 1 & 2 & \cancel{0} \; -1 & \cancel{-1} \; 0 \end{array}\right)$$

1r + = 2r × (−2)

$$\begin{array}{rrrrrrr} & 1 & 2 & 3 & 1 & 0 & 0 \\ - & 0 & 2 & 6 & 6 & 0 & -2 \\ \hline & 1 & 0 & -3 & & & \end{array}$$

$$\cancel{\left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 0 & -1 \\ 0 & 1 & 0 & -3 & 0 & 2 \\ 0 & 0 & 1 & 2 & 0 & -1 \end{array}\right)}$$

$$\begin{array}{rrrrr} & -3 & -5 & 0 & 2 \\ + & 3 & 6 & 0 & -3 \\ \hline & 0 & 1 & 0 & -1 \end{array} \qquad \begin{array}{rrrrr} & 3 & 3 & 0 & -1 \\ - & 3 & 6 & 0 & -3 \\ \hline & 0 & -3 & 0 & 2 \end{array}$$

$I_3 \mid A^{-1}$

$$\left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & -2 & 2 \\ 0 & 1 & 0 & -3 & 3 & -1 \\ 0 & 0 & 1 & 2 & -1 & 0 \end{array}\right)$$

$$\begin{array}{rrrrrrr} & 1 & 0 & -3 & -5 & 0 & 2 \\ + & 0 & 0 & 3 & 6 & -2 & 0 \\ \hline \end{array}$$

$$\begin{array}{rrrrrrr} & 0 & 1 & 3 & 3 & 0 & -1 \\ - & 0 & 0 & 3 & 6 & -3 & 0 \\ \hline & 0 & 1 & 0 & -3 & 3 & -1 \end{array}$$

$$(A \mid I_3) \to \cdots \to (I_3 \mid B)$$

$B = A^{-1}$

行基本変形

= 基本行列を左からかける.

正則 → $P =$

注) 基本行列は正則.

$$\boxed{P_\ell \cdots P_2 P_1}(A \mid I_3) = (I_3 \mid B)$$

$P(A \mid I_3)$

$$\| $$

$$(PA \mid PI_3) = (I_3 \mid B)$$

$$\|$$

$$(PA \mid P)$$

P : 正則

$$P(\vec{a}_1\, \vec{a}_2\, \vec{a}_3 \mid \vec{e}_1\, \vec{e}_2\, \vec{e}_3)$$

$$= (P\vec{a}_1, P\vec{a}_2, P\vec{a}_3 \mid P\vec{e}_1, P\vec{e}_2, P\vec{e}_3)$$

$$\underbrace{P^{-1}P}_{= I_3} A = P^{-1} I_3$$

$$PA = I_3. \xrightarrow[P^{-1}\cdot]{} A = P^{-1}. \ \text{正則.}$$

$$P = B$$

$(\text{正則})^{-1}$: 正則

$$A^{-1} = (P^{-1})^{-1} = P = B.$$

Ⓘ
$$\begin{pmatrix} 3 & 6 & -5 \\ 1 & 2 & -2 \\ -2 & -3 & 2 \end{pmatrix}^{-1}$$ を求めよ.

Ⓘⓘ
$$\begin{vmatrix} 1 & x & x \\ x & 1 & x \\ x & x & 1 \end{vmatrix} = ?$$

passer examen.