$$\overrightarrow{e_1} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad \xrightarrow[]{\text{線形変換}\ f} \quad f(\overrightarrow{e_1}) = \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \vec{a}$$

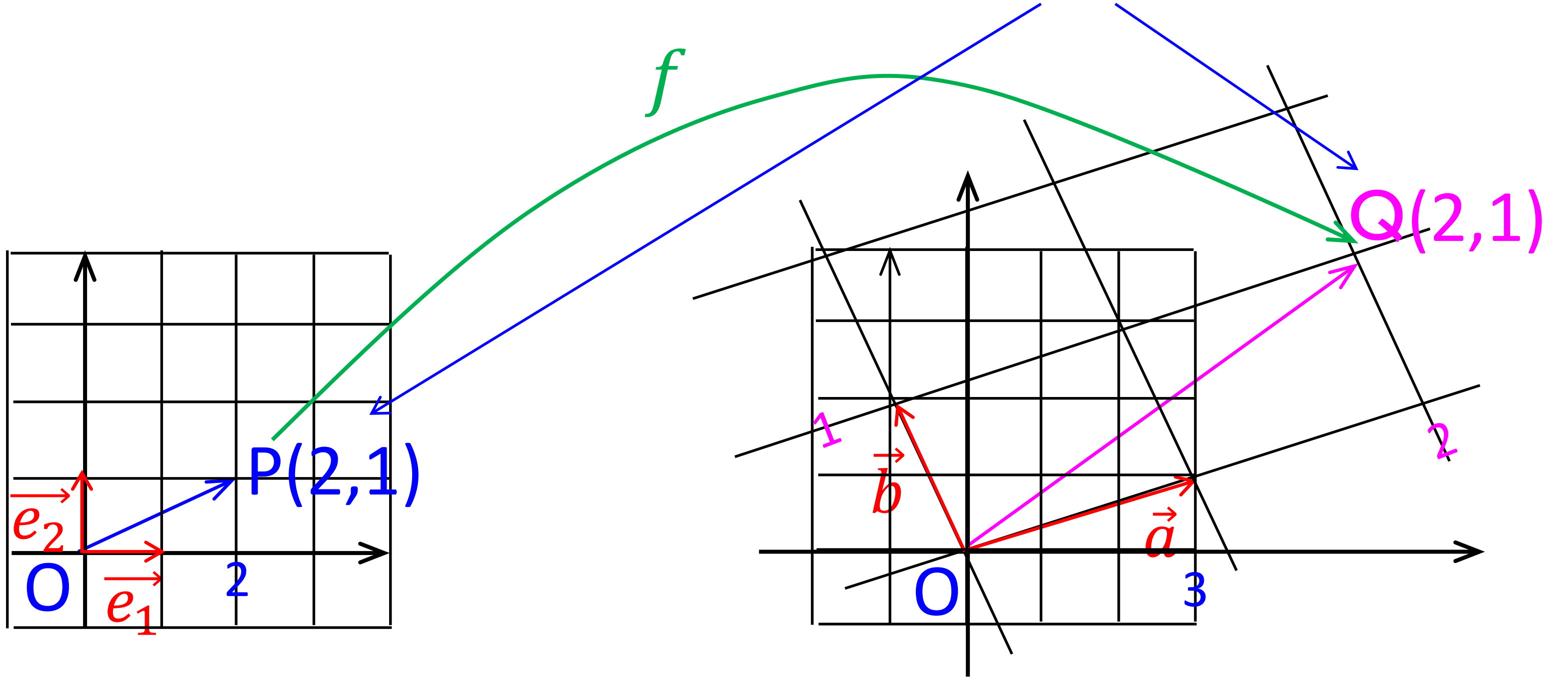
$$\overrightarrow{e_2} = \begin{pmatrix} 0 \\ 1 \end{pmatrix} \qquad\qquad f(\overrightarrow{e_2}) = \begin{pmatrix} -1 \\ 2 \end{pmatrix} = \vec{b}$$ になるとします

$$\overrightarrow{\mathrm{OP}} = x\overrightarrow{e_1} + y\overrightarrow{e_2} \quad \xrightarrow{f} \quad \overrightarrow{\mathrm{OQ}} = f(x\overrightarrow{e_1} + y\overrightarrow{e_2}) = xf(\overrightarrow{e_1}) + yf(\overrightarrow{e_2})$$

$$= x\begin{pmatrix} 3 \\ 1 \end{pmatrix} + y\begin{pmatrix} -1 \\ 2 \end{pmatrix}$$

$$= x\vec{a} + y\vec{b}$$

座標(x, y)は、何れも(2, 1)です



$f(\overrightarrow{e_1}) = \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \vec{a}$

$f(\overrightarrow{e_2}) = \begin{pmatrix} -1 \\ 2 \end{pmatrix} = \vec{b}$ としました

表現行列$A = \begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix} = (\vec{a}, \vec{b})$と書けます

$\vec{P} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$の時、$A\vec{P} = \vec{Q}$より$\vec{Q}$を求める

$$\begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix} \begin{pmatrix} 2 \\ 1 \end{pmatrix} = \begin{pmatrix} 3 \times 2 - 1 \times 1 \\ 1 \times 2 + 2 \times 1 \end{pmatrix} = \begin{pmatrix} 5 \\ 4 \end{pmatrix} = \vec{Q}$$