Date

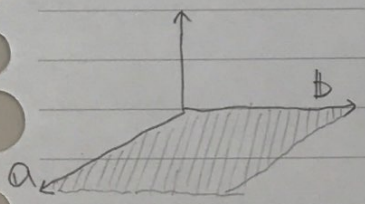
$e_2 \times e_3 = e_1$
$e_3 \times e_2 = -e_1$
$e_3 \times e_1 = e_2$
$(\alpha a) \times b = \alpha a \times b$
$a \times (\beta b) = \beta a \times b$
$(a_1 + a_2) \times b = a_1 \times b + a_2 \times b$
$a \times (b_1 + b_2) = a \times b_1 + a \times b_2$

$a = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix} = a_1 e_1 + a_2 e_2 + a_3 e_3$

$b = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix} = b_1 e_1 + b_2 e_2 + b_3 e_3$

$a \times b =$ → report

ベクトル積
空間ベクトル a, b
a, b, $a \times b$ が右手系



$a = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix} \quad b = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$

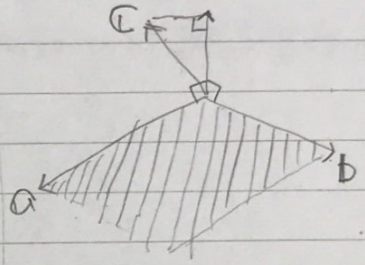
$a \times b = \begin{pmatrix} \begin{vmatrix} a_2 & b_2 \\ a_3 & b_3 \end{vmatrix} \\ \begin{vmatrix} a_3 & b_3 \\ a_1 & b_1 \end{vmatrix} \\ \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} \end{pmatrix} = \begin{pmatrix} a_2 b_3 - a_3 b_2 \\ a_3 b_1 - a_1 b_3 \\ a_1 b_2 - a_2 b_1 \end{pmatrix}$

report I →

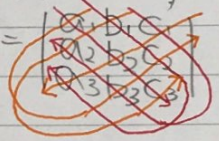
(1) $\begin{pmatrix} 5 \\ 2 \\ 7 \end{pmatrix} \times \begin{pmatrix} 1 \\ 8 \\ 2 \end{pmatrix}$

(2) $\begin{pmatrix} -3 \\ 5 \\ 9 \end{pmatrix} \times \begin{pmatrix} 11 \\ 2 \\ -5 \end{pmatrix}$

平行六面体の体積



$V(a, b, c)$



$= a_1 b_2 c_3 + a_3 b_1 c_2 + a_2 b_3 c_1$
$- a_3 b_2 c_1 - a_2 b_1 c_3 - a_1 b_3 c_2$

$(a \times b) \cdot c = |a \times b||c| \cos\theta$
内積　正射影
$= V(a, b, c)$

$a \times b = -b \times a$
$(\alpha a) \times b = \alpha a \times b$
$(a_1 + a_2) \times b = a_1 \times b + a_2 \times b$

任意に空間内のベクトル c をとる
$((a_1 + a_2) \times b) \cdot c = (a_1 \times b) \cdot c + (a_2 \times b) \cdot c$
$\|$
$V(a_1 + a_2, b, c) = V(a_1, b, c) + V(a_2, b, c)$

$x = y$
$x \cdot c = y \cdot c$
$(x - y) \cdot c = 0$

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$(x-y)\cdot c = 0$

$c = x-y$ とおくと

$|x-y|^2 = 0$

微分

$f: \mathbb{R}^n \to \mathbb{R}^m$　点 $x \in \mathbb{R}^n$ で微分

$f'(x)$ $\mathbb{R}^n$ から $\mathbb{R}^m$ への線型写像 ($m \times n$ の行列)

高階の微分