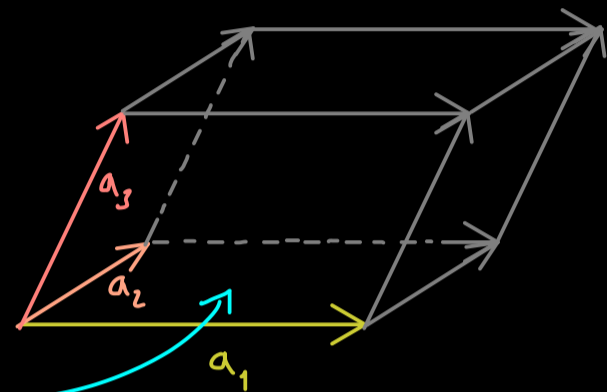


## Linear Algebra - Part 43

$A \in \mathbb{R}^{n \times n} \rightsquigarrow \det(A) \in \mathbb{R}$  with properties:

(1)  $A = \begin{pmatrix} | & & | \\ a_1 & \dots & a_n \\ | & & | \end{pmatrix}$ , columns span a parallelepiped

$$\text{volume} = |\det(A)|$$



(2)  $\det(A) = 0 \iff \begin{pmatrix} | \\ a_1 \\ | \end{pmatrix}, \dots, \begin{pmatrix} | \\ a_n \\ | \end{pmatrix}$  linearly dependent

$\iff A$  is not invertible

(3) sign of  $\det(A)$  gives orientation  $\left( \det(\mathbb{1}_n) = +1 \right)$