důkaz (2)

$$\boxed{w = u - \frac{u \cdot v}{v \cdot v} v} \leftarrow$$

ROVNOST

$w = 0$

$\Downarrow$

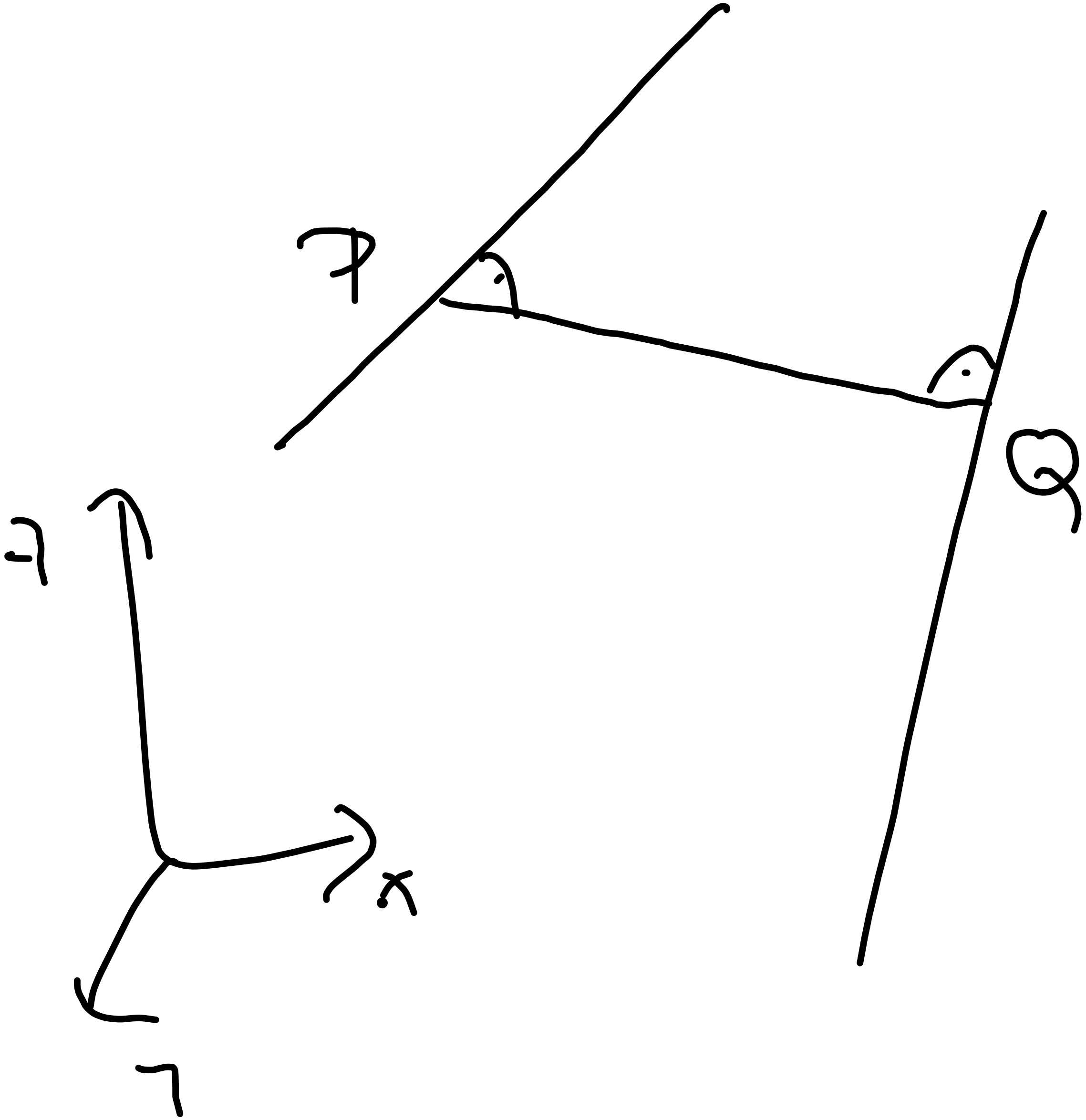
v, u .. LZ

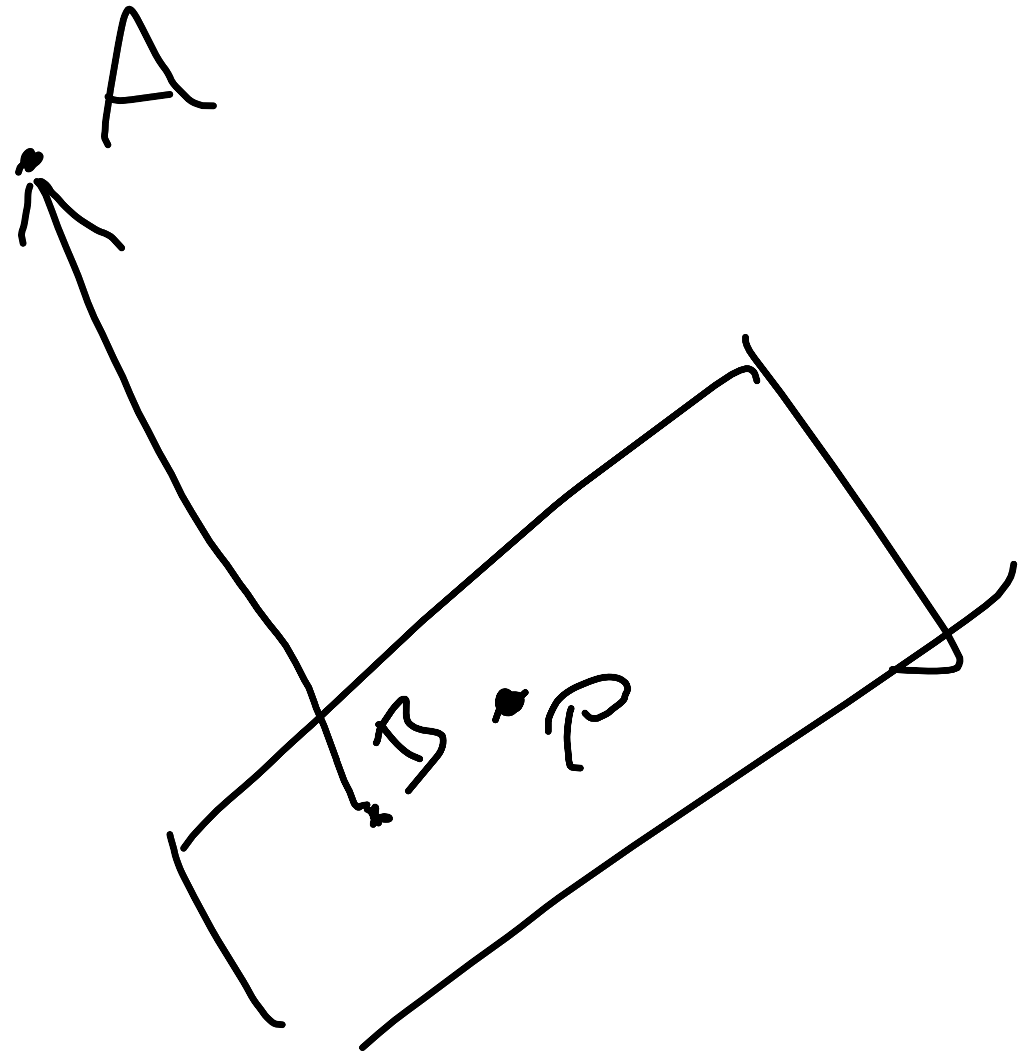
$$0 \le \|w\|^2 = \|u\|^2 - \frac{(u \cdot v)}{\|v\|^2}(u \cdot v) - \frac{(u \cdot v)}{\|v\|^2}(v \cdot u) + \frac{(u \cdot v)(u \cdot v)}{\|v\|^4}\|v\|^2$$

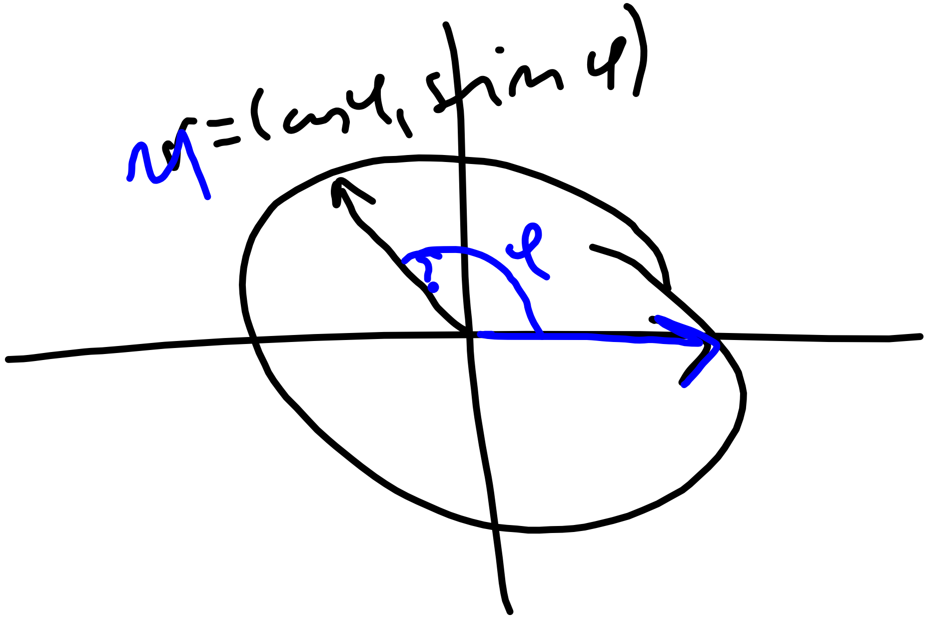
$/ \cdot \|v\|^2$

$$0 \le \|w\|^2 \|v\|^2 = \|u\|^2\|v\|^2 \overbrace{- 2(u \cdot v)\cdot(u \cdot v) + (u \cdot v)(u \cdot v)}^{-|(u \cdot v)|^2}$$

$$\|u\|^2\|v\|^2 \ge |(u \cdot v)|^2$$


P
Q
x


A
B
P



$$(u \cdot v) = \cos\varphi$$

$$\|u\| = \sqrt{\cos^2\varphi + \sin^2\varphi} = 1$$

$$\|v\| = \sqrt{1^2 + 0^2} = 1$$

$$A = [1,0,1]$$

$$q: [1,1,1] + t(\underline{2,1,0}) + s(\underline{0,1,1})$$

$$Z(q)^{\perp} = \langle (1,-2,2) \rangle$$

$$(2,1,0) \times (0,1,1)$$

$$\begin{pmatrix} 2 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix} = (1,-2,2)$$

$$B \in q$$

$$B = [1,1,1]$$

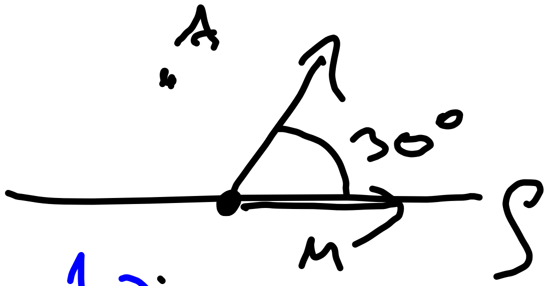
$$A - B = (0,-1,0)$$

$$\rho(A,q) = \frac{(0,-1,0)\cdot(1,-2,2)}{\|(1,-2,2)\|} = \frac{2}{9}$$

$$A = [1,0,0]$$
$$t = 0$$
$$s = 1$$
$$A \in q$$
$$A - B = (0,1,1)$$
$$\rho(\ ) = (0,-1,1)(\ldots) = 0$$

$A = [1,2] \qquad \varphi = 30^\circ$

$p: [0,1] + t(1,1)$

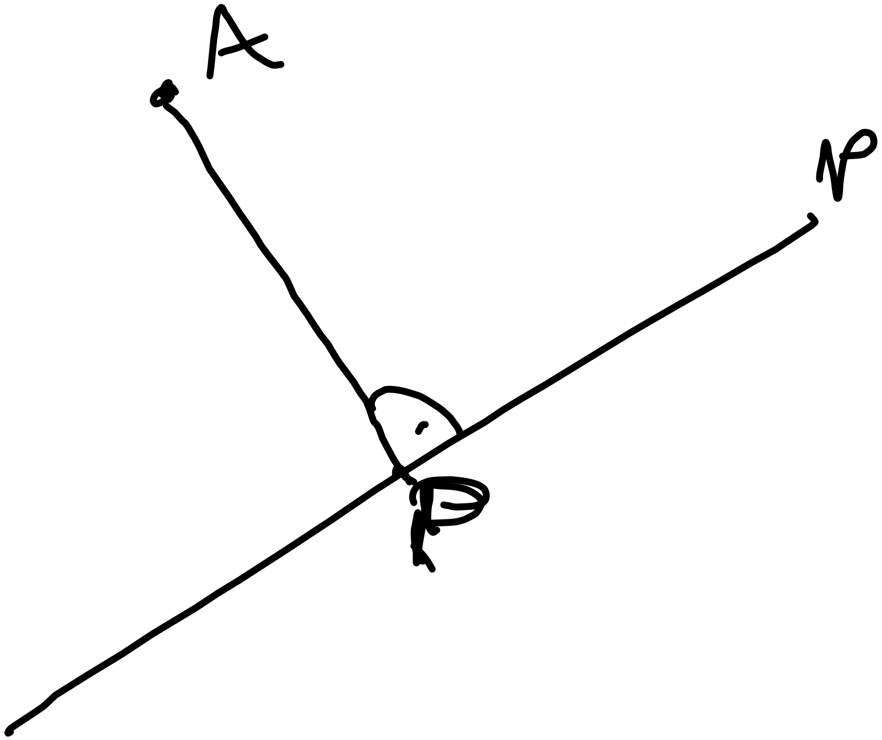


$$\begin{pmatrix} \cos 30^\circ & -\sin 30^\circ \\ \sin 30^\circ & \cos 30^\circ \end{pmatrix} = \begin{pmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{pmatrix}$$

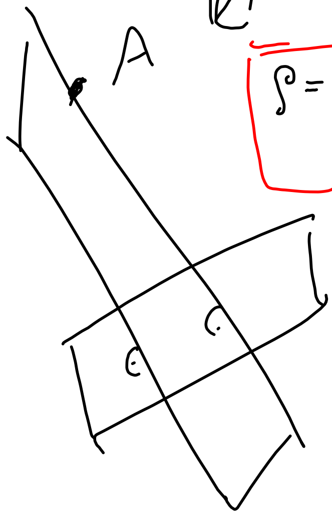
$$z(p) = \langle (1,1) \rangle$$

$$\begin{pmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} \frac{\sqrt{3}}{2} - \frac{1}{2} \\ \frac{\sqrt{3}}{2} + \frac{1}{2} \end{pmatrix}$$

$$p': [1,2] + t\left(\frac{\sqrt{3}}{2} - \frac{1}{2}, \frac{\sqrt{3}}{2} + \frac{1}{2}\right)$$



A
p
P



$\mathbb{R}^4$ $A = [1,2,3,4]$

$$\boxed{\rho = [1,0,1,0] + (1,2,-1,-2)s + (1,0,0,1)t}$$

$Z(\rho)^\perp$

ρ $v = (1,2,-1,-2)\cdot(a,b,c,d)$

$0 = (1,0,0,1)\cdot(a,b,c,d)$

$a+2b-c-2d=0$

$a+d=0$

$a=-d$

$2b-c-3d=0$

$d=2\ell \quad c=2k \quad b=3\ell+k$

$a=-3\ell-k$

$\rightarrow (Z(\rho))^\perp = \langle(-3,3,0,2),(-1,1,2,0)\rangle$

$\rightarrow \boxed{q: [1,2,3,4] + u(-3,3,0,2) + v(-1,1,2,0)}$

$p \cap q$

$1+s+t = 1-u$

$2s = 2+u$

$1-s = 3+2u-3v$

$-2s+t = 4+v$

$$\begin{array}{cccc|c} s & t & v & u & \\ \end{array}$$
$$\left(\begin{array}{cccc|c} 1 & 1 & 1 & 0 & 0 \\ 2 & 0 & 0 & -1 & 2 \\ -1 & 0 & 3 & 2 & 2 \\ -2 & 1 & -1 & 0 & 4 \end{array}\right) \sim \cdots \sim \boxed{\begin{array}{l} s = -8/19 \\ t = 34/19 \end{array}}$$

$\rho \ldots$

$p: [1,1,1] + t\,(2,1,0) \ni A$

$q: [2,2,0] + s\,(1,1,1) \ni B$

$A = [1,1,1] \qquad B = [2,2,0]$

$A - B = (-1,-1,-2)$

$(Z(p) + Z(q))^{\perp}$

$((2,1,0),(1,1,1)) =$

$$\begin{pmatrix} 2 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix} = (1,-2,1)$$

$(-1,-1,-2) = [a\,(2,1,0) + b\,(1,1,1)] + c\,(1,-2,1)$

$$\left(\begin{array}{ccc|c} 2 & 1 & 1 & -1 \\ 1 & 1 & -2 & -1 \\ 0 & 1 & 1 & -2 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 1 & -2 & -1 \\ 0 & -1 & 5 & 1 \\ 0 & 1 & 1 & -2 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 1 & -2 & -1 \\ 0 & 1 & 1 & -2 \\ 0 & 0 & 6 & -1 \end{array}\right)$$

$c = -\frac{1}{2}$?

$\| -\frac{1}{2}(1,-2,1) \| = \| (-\frac{1}{2}, 1, -\frac{1}{2}) \| = \sqrt{\frac{1}{4} + 1 + \frac{1}{4}}$

$= \sqrt{\frac{6}{4}} = \frac{\sqrt{6}}{2}$

$p: [1,1,1] + t(2,1,0)$

$q: [0,-1,-2] + s(1,2,3)$

$(z(p) + z(q))^{\perp} = ((2,1,0),(1,2,3))^{\perp} = \underline{(3,-6,3)}$

$\varrho: \underline{[1,1,1] + t(3,-6,3) + s(2,1,0)}$.

$[1,1,1] + t(2,1,0) + s(1,-2,1) = [0,-1,-2] + u(1,2,3)$

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

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

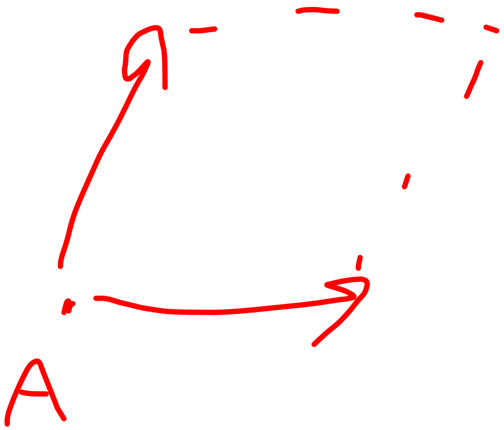
$u = 1$

$[0,-1,-2] + (1,2,3) =$

$= \boxed{[1,1,1]}$

$\underline{\underline{\sigma: [1,1,1] + t(1,-2,1)}}$

a
A



A

(u_1, u_2, u_3)
(v_1, v_2, v_3)
(t_1, t_2, t_3)

$$\underline{P_3(u, v, t)} = \begin{vmatrix} u_1 & v_1 & t_1 \\ u_2 & v_2 & t_2 \\ u_3 & v_3 & t_3 \end{vmatrix} = \begin{vmatrix} t_1 & t_2 & t_3 \\ u & & u \\ v & & v \end{vmatrix} =$$

$$= t \cdot (u \times v) \leq \|t\| \, \|u \times v\|$$

$$t = c(u \times v)$$