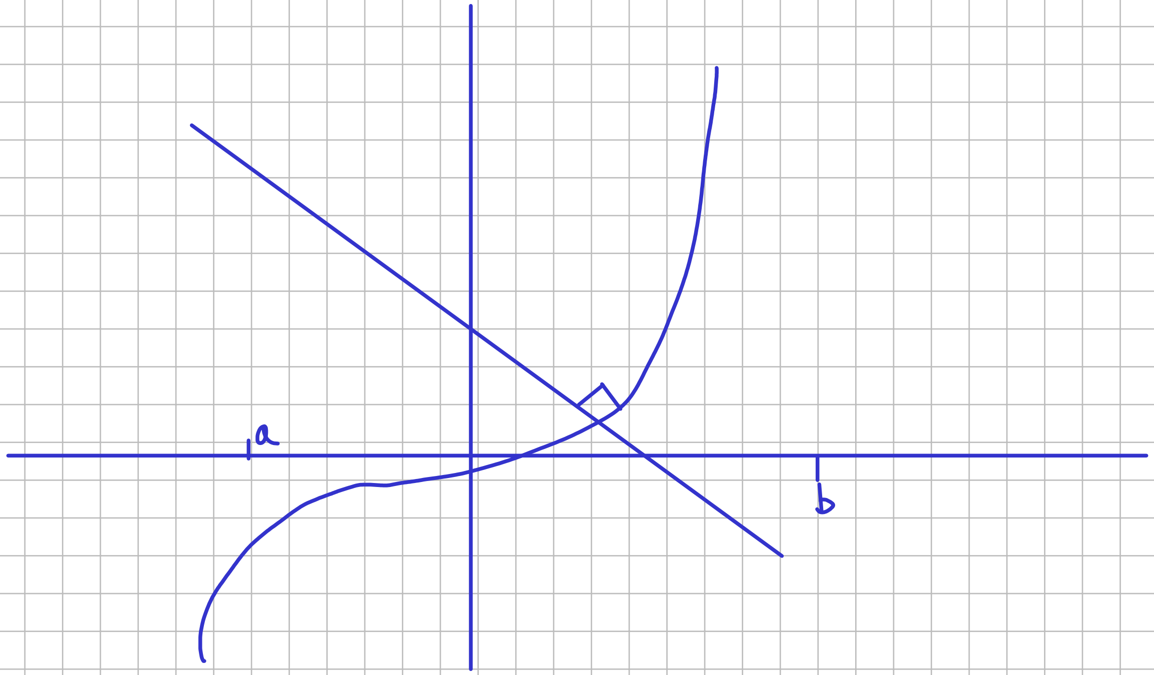

$u = \begin{pmatrix} -2 \\ -2 \end{pmatrix} \quad v = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$

$p_u v = \frac{-10}{\langle u, u \rangle} u = \frac{-10}{8} \begin{pmatrix} -2 \\ -2 \end{pmatrix} =$

$\|\cdot\|_A = \sqrt{\langle a, a \rangle_A}$

$\langle a, a \rangle_A = \|\cdot\|_A^2$

$$\langle A, B\rangle = \|A\|\cdot\|B\| \cos(\phi)$$

$$\|A\| = \sqrt{\langle A, A\rangle}$$

$$\cos\phi = \frac{\langle A, B\rangle}{\|A\|\cdot\|B\|}$$

$$A = \begin{pmatrix} 5 & -6 \\ 4 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 5 & 4 \\ -6 & -4 \end{pmatrix}$$

$$\langle A, B\rangle = 25 - 24 - 24 - 16 = -39$$

$$\langle A, A\rangle = 25 + 36 + 16 + 16 = 93, \ \|A\| = \|B\| = \sqrt{93}$$

$$\langle B, B\rangle = 25 + 16 + 36 + 16 = 93$$

$$\cos\phi = \frac{-39}{93} = \frac{-13}{31}$$

$$\langle v, u \rangle = \begin{pmatrix} -4 \\ -2 \end{pmatrix}^T A \begin{pmatrix} 1 \\ 4 \end{pmatrix} = -15$$

$$\langle u, u \rangle = \begin{pmatrix} 1 \\ 4 \end{pmatrix}^T A \begin{pmatrix} 1 \\ 4 \end{pmatrix} = 47.5$$

$$\therefore \quad P_u(v) = \frac{-15}{47.5} \times \begin{pmatrix} 1 \\ 4 \end{pmatrix} =$$

$$A = \begin{pmatrix} \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix} \begin{pmatrix} 2 & 0 \\ 0 & 5 \end{pmatrix} \begin{pmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{-1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix} = \begin{pmatrix} 3.5 & -1.5 \\ -1.5 & 3.5 \end{pmatrix}$$

$\|T(v)\| = \|v\| \ \forall v \in X$, $T: X \to Y$

Injective? T needs to map to unique points... $3D \to 2D$ can't be checked

Surjectiv? Is there an inverse?