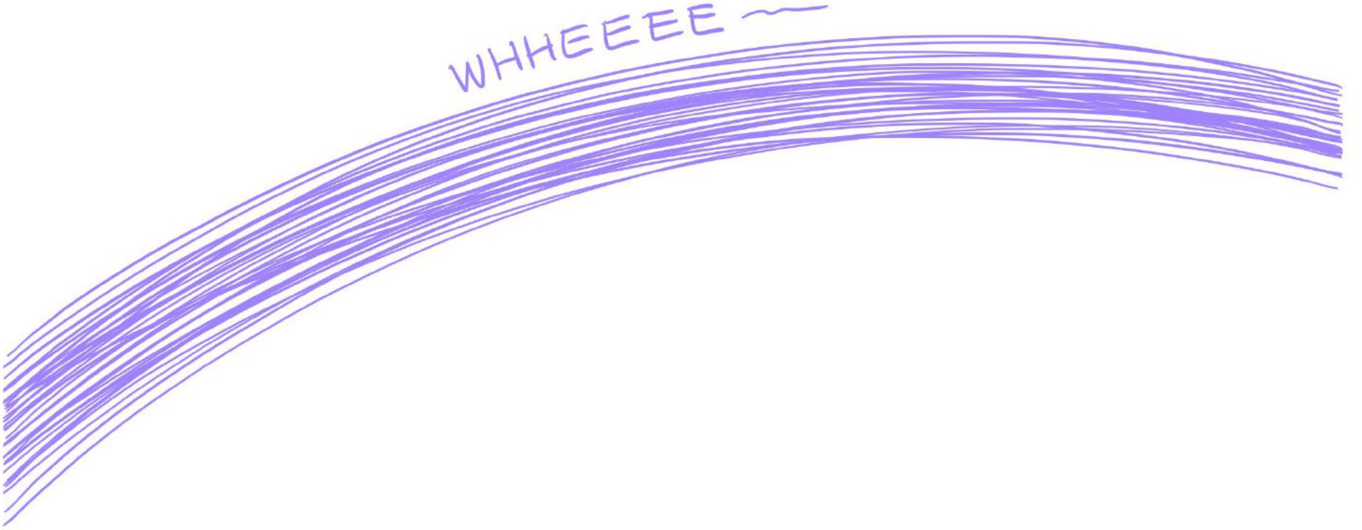

WHHEEEE ~

Lec 34

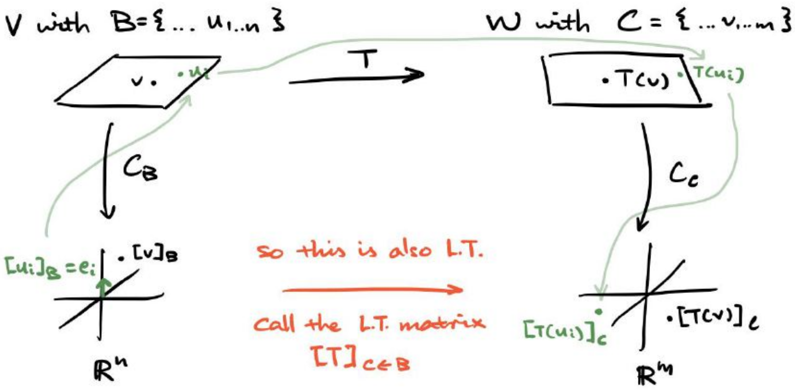
Recall coordinate vector

$B = \{b_1, \dots, b_n\}$ $\quad v = c_1b_1 + \cdots + c_nb_n \longleftrightarrow [v]_B = \begin{bmatrix} c_1 \\ \vdots \\ c_n \end{bmatrix}$

And

$$P_{C \leftarrow B} = \begin{bmatrix} | & & | \\ [b_1]_C & \cdots & [b_n]_C \\ | & & | \end{bmatrix}$$

Choosing basis



→ Once again, we can just write where each standard basis vec land.

So $[T]_{C \leftarrow B} = \begin{bmatrix} | & & | \\ [T(u_1)]_C & \cdots & [T(u_n)]_C \\ | & & | \end{bmatrix}$

Ex. $V = P_3$, $B = \{1, x, x^2, x^3\}$, $W = P_2$, $C = \{1, x, x^2\}$
$D : P_3 \to P_2$ via $p(x) \mapsto p'(x)$.
Find $[D]_{C \leftarrow B}$.

Well $D(1) = 0$ so $[D(1)]_C = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$
$D(x) = 1$ so $[D(x)]_C = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$
$D(x^2) = 2x$ so $[D(x^2)]_C = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix}$
$D(x^3) = 3x^2$ so $[D(x^3)]_C = \begin{bmatrix} 0 \\ 0 \\ 3 \end{bmatrix}$

So $[D]_{C \leftarrow B} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \end{bmatrix}$

Ex. Projecting onto $\ell = \operatorname{span}\left(\begin{bmatrix}1\\0\end{bmatrix}\right)$. Suppose $\mathcal{B} = \mathcal{C} = \mathcal{S} = \left\{\begin{bmatrix}1\\0\end{bmatrix}, \begin{bmatrix}0\\1\end{bmatrix}\right\}$

Then $[\operatorname{proj}_\ell]_{\mathcal{S}\leftarrow\mathcal{S}} = \begin{bmatrix} | & | \\ \left[\operatorname{proj}_\ell \begin{bmatrix}1\\0\end{bmatrix}\right]_{\mathcal{S}} & \left[\operatorname{proj}_\ell \begin{bmatrix}0\\1\end{bmatrix}\right]_{\mathcal{S}} \\ | & | \end{bmatrix}$

$= \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$