

Math 290A, Friday, May 1

Problem Session

Mon - CB (RQ)

- Sage

Tue - Problem Session / Homework
Writing 10 AM

Wed - Exam R

Final Exam

Tuesday, May 12

9 AM - two hour design / three hour limit

(8 AM by appointment)

Ex $M_{2,3} \not\cong \mathbb{C}^6$

$\dim(M_{2,3}) = 6 = \dim(\mathbb{C}^6) \Rightarrow M_{2,3} \cong \mathbb{C}^6$

$\rho_B : M_{2,3} \rightarrow \mathbb{C}^6$
 \uparrow
 invertible

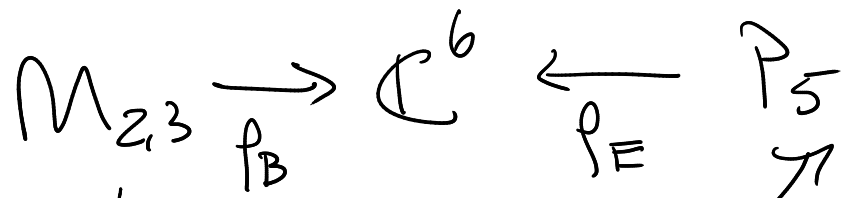
$B = \left\{ \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} \right\}$
 Coordination principle $\Rightarrow B$ basis
 \downarrow $\begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$ \downarrow

So ρ_B is an isomorphism

$C^* = \left\{ \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \dots, \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \right\}$

Ex $M_{2,3} \not\cong P_5$

$E = \{1, x, x^2, x^3, x^4, x^5\}$ basis of P_5



invertible $\rightarrow \rho_E^{-1} \circ \rho_B : M_{2,3} \rightarrow P_5$

VR. M10

M_{22}

$$S = \left\{ \begin{bmatrix} 33 & 99 \\ 78 & -9 \end{bmatrix}, \begin{bmatrix} -16 & -47 \\ -36 & 2 \end{bmatrix}, \begin{bmatrix} 10 & 27 \\ 17 & 3 \end{bmatrix}, \begin{bmatrix} -2 & -7 \\ -6 & 4 \end{bmatrix} \right\} \quad \text{basis?}$$

$$B = \left\{ \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix} \right\} \quad (B' = \left\{ \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \right\})$$

$$T = \left\{ \rho_B \left(\begin{bmatrix} 33 & 99 \\ 78 & -9 \end{bmatrix} \right), \dots \right\} = \left\{ \begin{bmatrix} 33 \\ 99 \\ 78 \\ -9 \end{bmatrix}, \begin{bmatrix} -16 \\ -47 \\ -36 \\ 2 \end{bmatrix}, \begin{bmatrix} 10 \\ 27 \\ 17 \\ 3 \end{bmatrix}, \begin{bmatrix} -2 \\ -7 \\ -6 \\ 4 \end{bmatrix} \right\} \subseteq \mathbb{C}^4$$

Is T linearly independent?

$$E = \left[\begin{array}{ccc|ccc} 33 & & & & & \\ 99 & & & & & \\ -78 & & & & & \\ -9 & & & & & \end{array} \right] \xrightarrow{\text{RREF}} I_4 \quad r=4=n \Rightarrow T \text{ linearly independent}$$

LIVRN

E row reduces to $I_n \Rightarrow E$ nonsingular \Rightarrow columns of E are basis of \mathbb{C}^4

$\Rightarrow T$ basis of \mathbb{C}^4

$\Rightarrow S$ basis of M_{22}

NME Part 8

Theorem CFI
Theorem CSS

Coordinate Principle