

DISOD, 12PM

* Things not written during dis in red

Concepts from lecture that will come up

- ① Systems of linear equations
- ② Vectors and vector operations
- ③ Matrix and matrix operations

Skills/Things to take away

- ① Geometric meaning of solutions to systems of linear equations
- ② Matrix-Matrix multiplication: when are products defined? and augmented matrix
- ③ Matrix-Matrix multiplication: computing using row picture
- ④ Matrix-Matrix multiplication: computing using column picture

Definitions

① Linear combination (of some objects):
a sum of the objects where each has been multiplied by a number

variables/numbers

$3a - 2b$
linear combination
of a, b

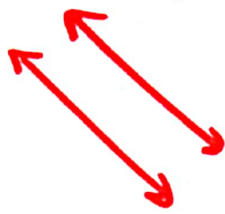
vectors

$2\vec{v}_1 + \vec{v}_2 + \vec{v}_3$
linear combination
of $\vec{v}_1, \vec{v}_2, \vec{v}_3$

matrices

$3A + 5B + 20I$
linear combination
of A, B, I

I (b) (iii) How many solutions?
No sol



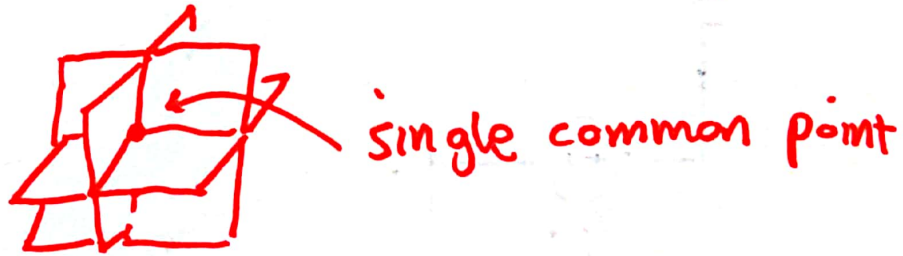
(iv) How many solutions?
No sol



(v) How many solutions?
Many solutions



(vi) How many solutions?
Single solution



Equation : lines , planes

Solution : intersections of lines , planes

2(a)

(i)

$$\begin{bmatrix} 3 \\ 6 \end{bmatrix} \in \mathbb{R}^2$$

Y	N
13	0

(ii)

$$\begin{bmatrix} 5 \\ 0 \\ 3 \end{bmatrix} \in \mathbb{R}^2$$

Y	N
0	13

(iii)

$$\begin{bmatrix} 5 \\ 3 \\ 0 \end{bmatrix} \in \mathbb{R}^2$$

Y	N
0	12

read as
"in"/"is an element of"/
"belongs to"

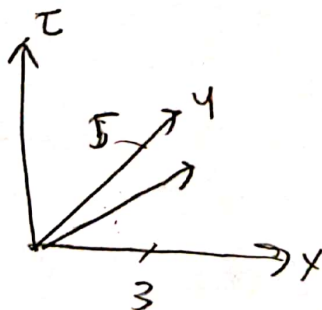
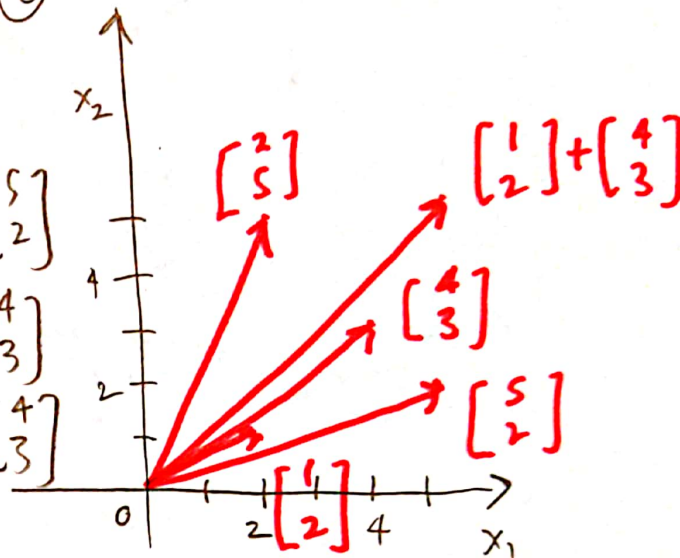
2(b), (c)

Plot

$$\begin{bmatrix} 2 \\ 5 \end{bmatrix}, \begin{bmatrix} 5 \\ 2 \end{bmatrix}$$

$$\begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 4 \\ 3 \end{bmatrix}$$

$$\begin{bmatrix} 1 \\ 2 \end{bmatrix} + \begin{bmatrix} 4 \\ 3 \end{bmatrix}$$



3 ~~3~~ Row picture

Column picture

(b) $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}$

$\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}$

$= \begin{bmatrix} 3 \cdot 1 + 4 \cdot 2 & 1 \cdot 2 + 4 \cdot 1 \\ 2 \cdot 3 + 3 \cdot 2 & 2 \cdot 2 + 3 \cdot 1 \end{bmatrix} = \begin{bmatrix} 3 \begin{bmatrix} 1 \\ 2 \end{bmatrix} + 2 \begin{bmatrix} 4 \\ 3 \end{bmatrix} & 2 \begin{bmatrix} 1 \\ 2 \end{bmatrix} + 1 \begin{bmatrix} 4 \\ 3 \end{bmatrix} \end{bmatrix}$

How to tell if product works

cols of left matrix = # of rows of right matrix

$A \cdot B \Rightarrow$ evaluable only if $n=p$
 $\underbrace{m \times n} \quad \underbrace{p \times q}$

$A \cdot B = A \cdot B$
 $\underbrace{m \times n} \quad \underbrace{n \times q} \quad \underbrace{m \times q}$

3 (f) $C \cdot D$ evaluable?

Y	N
6	1

$C \cdot D \Rightarrow$ evaluable
 $2 \times 4 \quad 4 \times 3$

DC evaluable?
 $4 \times 3 \quad 2 \times 4$

Y	N
1	(f)