hoel

Review for Exam 1. Emphasize Chapter 3. (4 subspace) (for first part of Case)

①

Suppose u, v, w are non zero vectors in R^7

What are possible vector space?

What are the possible dim of subspace span by u, v, and w?

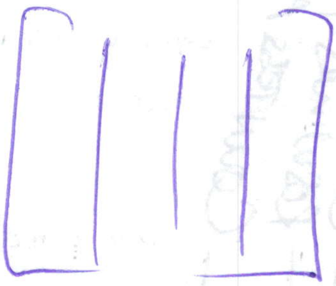
1, 2 or 3.

- Cannot be more because we only have 3 vectors
- Cannot be zero, because, said it was non-zero)

We have 5X3 matrix called U
It is in echelon form, and it has 3 pivots, r=3.

(1) what is null space?

Helpful what 5X3 means.



5 rows
3 column
3 pivots

$N(U) = 0 \text{ vector} \left\{ \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \right\}$

$B = \begin{bmatrix} 4 \\ 24 \end{bmatrix}$ (A) what is echelon form (matrix)
(B) and rank?

row reduction will take us to which matrix?

$\boxed{\text{reduced}}$ $\xrightarrow{(A)}$ $\begin{bmatrix} 4 \\ 0 \end{bmatrix}$

$$C = \begin{bmatrix} 4 & 4 \\ 4 & 0 \end{bmatrix}$$ (A)

What's echelon form?

— What would row reduction do?

A Source

$$\boxed{\begin{matrix} 4-4=0 \\ 4-0=-4 \end{matrix}}$$

~~(ERO)~~

Subtract top/Bottom

$$\rightarrow \begin{bmatrix} 4 & 4 \\ 0 & -4 \end{bmatrix} \text{ (B)} \rightarrow \text{(C)} \begin{bmatrix} 4 & 0 \\ 0 & -4 \end{bmatrix}$$

B Source

~~took~~ 4-4

(A) took (4-0) away from 44) to get (B)

(B) took 0-4 ~~off~~ away from ~~44~~ 44 to get (C)

⇒ So if I am starting for RREF will need $\begin{pmatrix} 1 & \\ & 1 \end{pmatrix}$

$$\rightarrow \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix} \Rightarrow$$

What's rank of matrix? (C)

— given that I know the original 4 has rank 3.

= 6.

rank of B? ⇒ 3.

what Dim $N(C^T)$

$C = \overset{m}{10} \times 6$

$= 4.$

the equation $Ax = \begin{bmatrix} 2 \\ 4 \\ 2 \end{bmatrix}$ and complete solution $x = \begin{bmatrix} \\ \\ \end{bmatrix}$

$$x = \begin{bmatrix} 2 \\ 0 \\ 0 \end{bmatrix} + c \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} + d \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

(but we do not get the matrix?)

$\Rightarrow$ what Dim of row space?

question start in Backward way

$\Rightarrow$ I get answer

what is the problem

: Ok, what shape of matrix?

3x3 matrix (called)

rank = 1

two vectors not being independent.

Dim $N(A) = 2$

: what is the matrix?

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & -2 & 0 \\ 1 & -1 & 0 \end{bmatrix}$$

for what vector b $Ax = b$ can be solved if

if b has form, b is multiple of

$$b = c \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$$

Don't forget other case

$r = m$, $r = n$

If nullspace is just zero vector [square matrix],

what about nullspace of A^T?

if $N(A) = 0$, and matrix is square

what do I know about nullspace A^T.

$\Rightarrow$ also $= 0$.

Look at the space of 5×5 matrices of vector space

~~Does~~ the invertible matrices form a subspace.

if $b^2 = 0$, then $b = 0$ $\Rightarrow$ $\boxed{\text{False}}$

$B = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ ← Best Example

$\Rightarrow$ $n \times n$ matrix

independent cols

$Ax = b$ always solvable?

Matrix:

$$\underset{(3\times4)}{B} = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -1 & 2 \\ 0 & 1 & 1 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

What Basis null space $N(B)$? $\leq R^4$

Basis for $N(B)$

Dim

rank =

Is the matrix invertible? (Yes)

Aside

$N(CD) = N(D)$

if C invertible

$$\text{Basis for } N(B) = \begin{bmatrix} 1 \\ -1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -2 \\ 1 \\ 0 \\ 1 \end{bmatrix}$$

Complete solution $Bx = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$

$$x_p + x_n = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} + \underline{c}\begin{bmatrix} \\ \end{bmatrix} + \underline{d}\begin{bmatrix} \\ \end{bmatrix}$$

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T or F —

Q If A, B same 4 subspaces then

$A = cB$ [not true]

Eg. : A, B any invertible 6x6 [gives]

Q If Matrix A, and exchange 2 of its rows, which subspaces stay the same

⇒ 1) rowspace 2) nullspace

ie. Not column space

$V = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ can't be in nullspace and ~~rowspace~~ be row of A

why not?

those are same in dual space

⇒ they can't overlap.