Lesson Plan
SI Session #11
August 30, 2017

SI Leader: Eason Chang

Course: Math 18
Academic Quarter: Summer Session 2 2017
Instructor: Professor Drimbe

Topics Covered:
Dimension and Basis Col Space and Nul Space

TEACHING + LEARNING
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Opener Activity:

5:05pm - 5:10pm

Talk about: Review together on what dimension and basis are for a Col Space or Null Space

Activity 1

5:10pm - 5:30pm

Matrix A with f rows and g columns: f x g

- Col(A) is a subspace of Rf
- Nul(A) is a subspace of Rg
    - Nul(A) is the solution to Ax=0, which are the x's, x is g x 1 so you need to match the x of rows of x to the # of columns of A

Practice Problem 1a:

. Find a basis for the row space, column space, and null space of the matrix given below:

$$A = \begin{bmatrix} 3 & 4 & 0 & 7 \\ 1 & -5 & 2 & -2 \\ -1 & 4 & 0 & 3 \\ 1 & -1 & 2 & 2 \end{bmatrix}$$

Practice Problem 1a Solutions:

a basis for the column space of A is $\left\{ \begin{bmatrix} 3 \\ 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 4 \\ -5 \\ 4 \\ -1 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 0 \\ 2 \end{bmatrix} \right\}$.

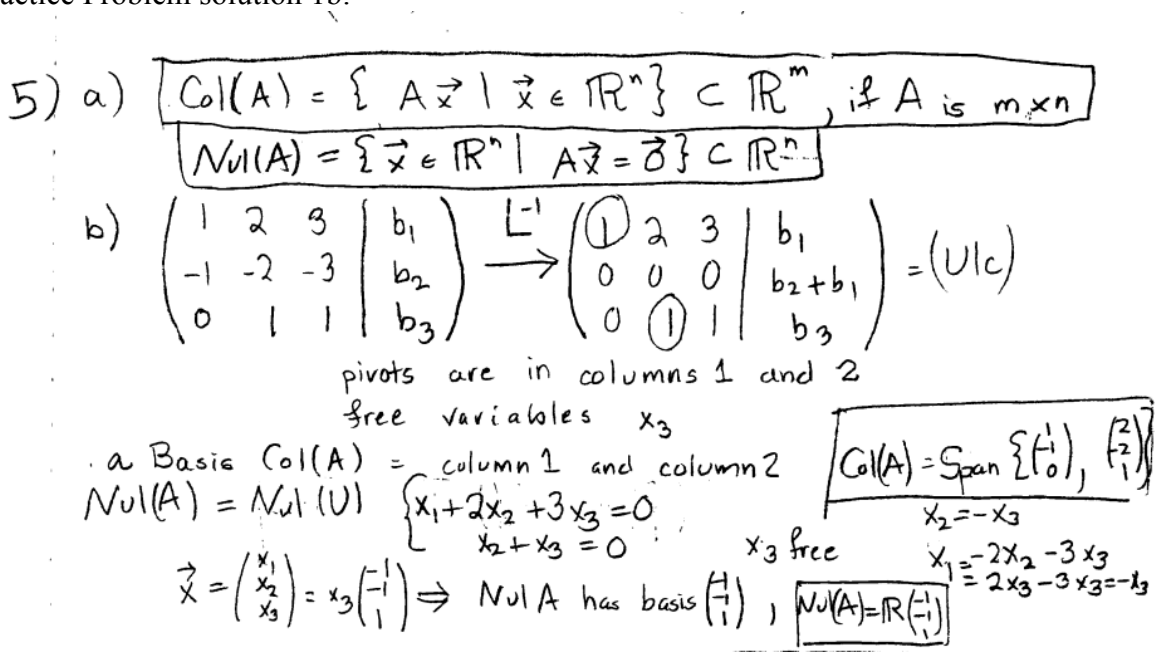
If we solve $A\mathbf{x} = \mathbf{0}$, we find that x_4 is a free variable, so we set $x_4 = r$. We obtain $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = r \begin{bmatrix} -1 \\ -1 \\ -1 \\ 1 \end{bmatrix}$, so $\left\{ \begin{bmatrix} -1 \\ -1 \\ -1 \\ 1 \end{bmatrix} \right\}$ is a basis for the nullspace of A.

Practice problem 1b:

5) a) Define column space Col(A) of an mxn matrix A. Then define the null space Nul(A).

b) Compute the Column space of the matrix $A=\begin{pmatrix} 1 & 2 & 3 \\ -1 & -2 & -3 \\ 0 & 1 & 1 \end{pmatrix}$. Then compute Nul(A).

Practice Problem solution 1b:



Activity 2

5:30pm - 5:45pm

Practice Problem 2a:

Theorem: If A is invertible, then Nul (A) is { 0 }.

Solution to Practice Problem 2a:

If A mxn is invertible, how many pivots does it have?

Practice Problem 2b:

(60 pts.) Suppose that A is an $n \times n$ matrix and that R is the reduced row echelon form of A. You are given R but *are not given* A. For each of the following explain why you can or cannot answer it given R but not A.

(a) Does A^{-1} exist?
(b) What is a basis for Nul A?
(c) What is a basis for Col A?
(d) What is a basis for Row A?
(e) What are the eigenvalues of A?
(f) Does $A\mathbf{x} = \mathbf{b}$ have a solution when $\mathbf{b}$ is the first column of the identity matrix I?

Closure- Survey/ Feedback

5:45pm- 5:50pm

- Wrap-up:
    - Please share with the group one thing you gained understanding of through the session today.
    - Make a note to yourself/ write down anything you need to review/ do more practice problems on.

- Survey/ Feedback:
    1. How fun was the session? (1-10)
    2. How useful was the session? (1-10)
    3. Would you come back? (yes or no)
    4. Optional: Comments (pace of the activity), questions, concerns, suggestions, feedback on the back or wherever

Please recommend SI to your friends/ peers if you found the session useful! Thanks for coming and have a great day :)

PLANNING THE SI SESSION

SI Leader:
Session Date & Day of Week:
Course:
Course Instructor:

	Content to cover:	**Collaborative Learning Technique**	**Strategy to be used:**
Warm-up/ Opening: **(2-4 min.)**			

Please provide a **DETAILED BREAKDOWN** of warm-up activity **OR** attach corresponding document(s)

	Content to cover:	**Collaborative Learning Technique**	**Strategy to be used:**
Cool-down/ Closing: **(2-4 min.)**			

Please provide a **DETAILED BREAKDOWN** of cool-down activity **OR** attach corresponding document(s)

Workout: **(44-46 min.)**	**Content to cover:**	**Collaborative Learning Technique(s)**	**Strategy(ies) to be used:**

Please provide a **DETAILED BREAKDOWN** of workout activity **OR** attach corresponding document(s)