Lesson Plan
SI Session #9
August 25, 2017

SI Leader: Eason Chang

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

Topics Covered:
Col Space and Nul Space

TEACHING + LEARNING
commons

Opener Activity:

5:05pm - 5:10pm

Talk about: topics that were hard on the midterm, and topics that you comfortable or not comfortable with now.

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:

EXAMPLE 5 Let

$$A = \begin{bmatrix} 2 & 4 & -2 & 1 \\ -2 & -5 & 7 & 3 \\ 3 & 7 & -8 & 6 \end{bmatrix}$$

a. If the column space of A is a subspace of $\mathbb{R}^k$, what is k?

b. If the null space of A is a subspace of $\mathbb{R}^k$, what is k?

Practice Problem 1a Solutions:

SOLUTION

a. The columns of A each have three entries, so Col A is a subspace of $\mathbb{R}^k$, where $k = 3$.

b. A vector $\mathbf{x}$ such that $A\mathbf{x}$ is defined must have four entries, so Nul A is a subspace of $\mathbb{R}^k$, where $k = 4$. ■

Practice problem 1b:
Find the vector x determined by coordinate [x]beta and the given basis beta

$$\mathcal{B} = \left\{ \begin{bmatrix} -1 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ -5 \\ 2 \end{bmatrix}, \begin{bmatrix} 4 \\ -7 \\ 3 \end{bmatrix} \right\}, [\mathbf{x}]_{\mathcal{B}} = \begin{bmatrix} -4 \\ 8 \\ -7 \end{bmatrix}$$

Practice Problem solution 1b:

We calculate that

$$\mathbf{x} = (-4)\begin{bmatrix} -1 \\ 2 \\ 0 \end{bmatrix} + 8\begin{bmatrix} 3 \\ -5 \\ 2 \end{bmatrix} + (-7)\begin{bmatrix} 4 \\ -7 \\ 3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ -5 \end{bmatrix}.$$

Activity 2

5:30pm - 5:45pm

Practice Problem 2a:

(36 pts.) Let $A = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & -2 & -2 \\ 2 & 1 & 1 & 4 & 5 \\ 1 & 0 & 0 & 3 & 3 \end{bmatrix}$. I found that $\begin{bmatrix} 1 & 0 & 0 & 3 & 0 \\ 0 & 1 & 1 & -2 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$ is the reduced echelon form of A. Give bases and dimensions for the following three spaces.

$$\text{Col } A \qquad \text{Nul } A \qquad \text{Row } A.$$

Solution to Practice Problem 2a:

Since columns 1, 2 and 5 are pivot columns, we can compute the dimensions:

$$\dim(\text{Col } A) = \dim(\text{Row } A) = 3 \quad \text{and} \quad \dim(\text{Nul } A) = 2.$$

The first, second and fifth columns of A are a basis for Col A.
The nonzero rows of the reduced echelon form are a basis for Row A.

A basis for Nul A is $\begin{bmatrix} 0 \\ -1 \\ 1 \\ 0 \\ 0 \end{bmatrix}$ and $\begin{bmatrix} -3 \\ 2 \\ 0 \\ 1 \\ 0 \end{bmatrix}$.

Goal: Review the topics covered in the lecture, to better prepare the students. (Students were given less help so they can apply the knowledge)

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)