Lesson Plan
SI Session #3
August 11, 2017

SI Leader: Eason Chang

Course: Math 18
Academic Quarter: Summer Session2 2017
Instructor: Professor Drimbe

Topics Covered:
Linear Dependence and Row Echelon Forms

TEACHING + LEARNING
commons

Opener Activity:

5:05pm - 5:10pm

- Spend 5 minutes to note storm, then proceed with a vocabulary quiz.

Activity 1

5:10pm - 5:30pm

A system of linear equations is said to be **homogeneous** if it can be written in form Ax=0.

A set of vector is **linearly independent** if the vector equation has only the trivial solution

Practice Problem 1a:

Determine if $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ is linearly independent.
If possible, find a linear dependence relation among $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$.

$$\text{Let } \mathbf{v}_1 = \begin{bmatrix} 1 \\ 3 \\ 5 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} 2 \\ 5 \\ 9 \end{bmatrix}, \mathbf{v}_3 = \begin{bmatrix} -3 \\ 9 \\ 3 \end{bmatrix}.$$

Practice Problem 1a Solutions:

$$x_1 \begin{bmatrix} 1 \\ 3 \\ 5 \end{bmatrix} + x_2 \begin{bmatrix} 2 \\ 5 \\ 9 \end{bmatrix} + x_3 \begin{bmatrix} -3 \\ 9 \\ 3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}.$$

Augmented matrix:

$$\begin{bmatrix} 1 & 2 & -3 & 0 \\ 3 & 5 & 9 & 0 \\ 5 & 9 & 3 & 0 \end{bmatrix} \sim \begin{bmatrix} 1 & 2 & -3 & 0 \\ 0 & -1 & 18 & 0 \\ 0 & -1 & 18 & 0 \end{bmatrix} \sim \begin{bmatrix} 1 & 2 & -3 & 0 \\ 0 & -1 & 18 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

x_3 is a free variable $\Rightarrow$ there are nontrivial solutions.

$\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ is a linearly dependent set

Activity 2

5:30pm - 5:45pm

Practice Problem 2a:

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

   (a) Find the RREF (reduced row echelon form) of A.

   Sol.

   (b) Describe the solution set of the homogeneous equation $A\mathbf{x} = \mathbf{0}$.

Solution to Practice Problem 2a:

$$\begin{bmatrix} 1 & -1 & 1 \\ -1 & 0 & -2 \\ -5 & 7 & -3 \end{bmatrix} \overset{\substack{r_2 \to r_2 + r_1 \\ r_3 \to r_3 + 5r_1 \\ \text{pivot at (1,1)}}}{\sim} \begin{bmatrix} 1 & -1 & 1 \\ 0 & -1 & -1 \\ 0 & 2 & 2 \end{bmatrix}$$

$$\overset{\substack{r_3 \to r_3 + 2r_2 \\ \text{pivot at (2,2)}}}{\sim} \begin{bmatrix} 1 & -1 & 1 \\ 0 & -1 & -1 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\overset{r_2 \to -r_2}{\sim} \begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\overset{\substack{r_1 \to r_1 + r_2 \\ \text{pivot at (2,2)}}}{\sim} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

The corresponding linear system is $\begin{cases} x_1 = -2x_3 \\ x_2 = -x_3 \\ x_3 = x_3, \quad \text{(free)} \end{cases}$

So the general solution is given by: $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = x_3 \begin{bmatrix} -2 \\ -1 \\ 1 \end{bmatrix}$, where x_3 is arbitrary.

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)