

Lesson Plan
SI Session #1
August 8, 2017

SI Leader: Eason Chang

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

Topics Covered:
Row Reduction and Echelon Forms



Opener Activity:

5:05pm - 5:10pm

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

Activity 1

5:10pm - 5:30pm

Refer back to notes.

Definition:

A matrix is in echelon form if it has

- 1. All nonzero rows are above any rows of all zeros**
- 2. Each leading entry of a row is in a column to the right of the leading entry of the row above it.**
- 3. All entries in a column below a leading entry are zeros**

If a matrix in echelon form has the following conditions, then it is in reduced echelon form

4. The leading entry in each nonzero row is 1
5. Each leading 1 is the only nonzero entry in its column

Which matrix is in echelon form, which is reduced echelon form?

$$\begin{bmatrix} 2 & -3 & 2 & 1 \\ 0 & 1 & -4 & 8 \\ 0 & 0 & 0 & 5/2 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} 1 & 0 & 0 & 29 \\ 0 & 1 & 0 & 16 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

echelon

reduced echelon

Manipulating a matrix

- I. Interchange two rows
- II. Multiply one row by a nonzero number.
- III. Add a multiple of one row to a different row

Practice Problem 1a:

$$\begin{bmatrix} 2 & -3 & 2 & 1 \\ 0 & 1 & -4 & 8 \\ 0 & 0 & 0 & 5/2 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} 1 & 0 & 0 & 29 \\ 0 & 1 & 0 & 16 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

Practice Problem 1a Solutions:

$$2x_1 - 3x_2 + 2x_3 = 1$$

$$x_2 - 4x_3 = 8$$

$$0 = 5/2$$

No solution.

$$x_1 = 29$$

$$x_2 = 16$$

$$x_3 = 3$$

Practice Problem 1b

$$10) \quad 4x - 2y = 2$$

$$5x - 2y + z = 7$$

$$3x + 4y - z = 3$$

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 4 \end{bmatrix}$$

Practice Problem 1b Solutions:

$$\begin{bmatrix} 4 & -2 & 0 & 2 \\ 5 & -2 & 1 & 7 \\ 3 & 4 & -1 & 3 \end{bmatrix} \rightarrow \begin{bmatrix} 4 & -2 & 0 & 2 \\ 5 & -2 & 1 & 7 \\ 8 & 2 & 0 & 10 \end{bmatrix} \rightarrow \begin{bmatrix} 12 & 0 & 0 & 12 \\ 13 & 0 & 1 & 17 \\ 4 & 1 & 0 & 5 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & 0 & 1 \\ 4 & 1 & 0 & 5 \\ 13 & 0 & 1 & 17 \end{bmatrix} \rightarrow$$

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 4 \end{bmatrix}$$

$$\text{Row3} = \text{Row2} + \text{Row3}$$

$$\text{Row1} = \text{Row1} + \text{Row3}, \text{Row2} = \text{Row2} + \text{Row3}$$

$$\text{Row1} = 1/12 * \text{Row1}, \text{Row2} \leftrightarrow \text{Row3}$$

$$\text{Row2} = \text{Row2} - 4 * \text{Row1}$$

$$\text{Row3} = \text{Row3} - 13 * \text{Row1}$$

Activity 2

5:30pm - 5:45pm

Practice Problem 2a: Row reduced echelon form

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 1 & 2 & 3 \end{bmatrix}$$

Solution to Practice Problem 2a:

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 1 & 2 & 3 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 2 & 3 \\ 0 & 1 & 2 & 3 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 2 & 3 \end{bmatrix} \rightarrow$$
$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & -1 & -2 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Row 2 = Row 1 - Row 2

Row 2 <-> Row 3

Row 4 = Row 2 - Row 4

Row 1 = Row 1 - Row 2

Practice Problem 2b:

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

Solution to Practice Problem 2b:

(b)

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

$$\text{Row2} = \text{Row2} - 2 * \text{Row1}$$

$$\text{Row3} = \text{Row3} - \text{Row1}$$

$$\text{Row3} = \text{Row3} - \text{Row2}$$

$$\text{Row2} = -1/2 * \text{Row2}$$

Practice Problem 2c:

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

Solution to Practice Problem 2c:

(d)

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & -2 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & -1 \\ 0 & -1 & -2 \end{bmatrix} \rightarrow$$
$$\begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \end{bmatrix}$$

$$\text{Row2} = \text{Row2} - 2 * \text{Row1}$$

$$\text{Row1} = \text{Row1} + 2 * \text{Row2}$$

$$\text{Row2} = -1 * \text{Row2}$$

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:

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

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

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

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)