PASS
PEER ASSISTED STUDY SESSIONS

FACIL: Neil Douglas
WEEK: 8
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OFFICE: CSAS, 4th Floor MacOdrum Library
COURSE: ECOR 2606
OFFICE HOURS: Fridays 3:00 pm to 4:00 pm

Core concepts covered today:

- Solving series of linear equations
  - Gauss-Jordan Elimination
  - Jacobi Method
  - Gauss-Seidel Method
  - A little bit of LU Factorization

Opener (5 mins)

Last week there seemed to be some distaste towards the pivoting equation, but the good news is that we won't be using that to break down our matrices today! Today we'll employ elementary row operations to break down our matrices (think back to MATH1104!).

Many of you probably haven't used these in over a while, so for the opener today we'll do a little refresher. Partner up, and find out what are the three elementary row operations that we can use to manipulate matrices. The first pair to tell me them gets a prize!

Activity 1 – Gauss-Jordan Elimination (25 mins)

Solve the following series of linear equations using Gauss-Jordan Elimination. For reference, the solution to these equations when you do left division on MATLAB is $\begin{bmatrix} x1 \\ x2 \\ x3 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$, so let's see if we get the same answer when we solve by hand using Gauss-Jordan.

$$x_1 + x_2 - x_3 = 1$$

$$4x_1 + 2x_2 + 2x_3 = 14$$

$$x_1 + 6x_2 - 2x_3 = 4$$

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Activity 2 – Jacobi Method and Gauss-Seidel Method (40 mins)

(a) Solve the first iteration of the Jacobi Method for the following series of linear equations, which is shown in the form of Ax=b. Set $x_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$.

$$\begin{bmatrix} 1 & 1 & 6 \\ 4 & 2 & 2 \\ 1 & 6 & -2 \end{bmatrix} x = \begin{bmatrix} 15 \\ 14 \\ 4 \end{bmatrix}$$

(b) For the same set of linear equations presented in Part (a), complete the first iteration of the Gauss-Seidel Method. Set $x_0 = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$.

Closer (10 minutes)

Today we weren't able to cover LU factorization, which is another useful method for solving series of linear equations, and is helpful for when you want to solve a series of linear equations (in the form Ax=b) for multiple different b-values.

For our closer, partner up and see if the two of you can determine the three major steps required to solving a series of linear equations using LU factorization. The pair to tell me the correct answer first will get a prize!

Step 1: Put coefficient matrix A in its upper triangular and lower triangular form by performing ________________ (a few possible answers) on the matrix.

Step 2: Find _________ using the following equation(s):

Step 3: Find _________ using the following equation(s):

If you want some practice with this (and you do!), YouTube is a great source!