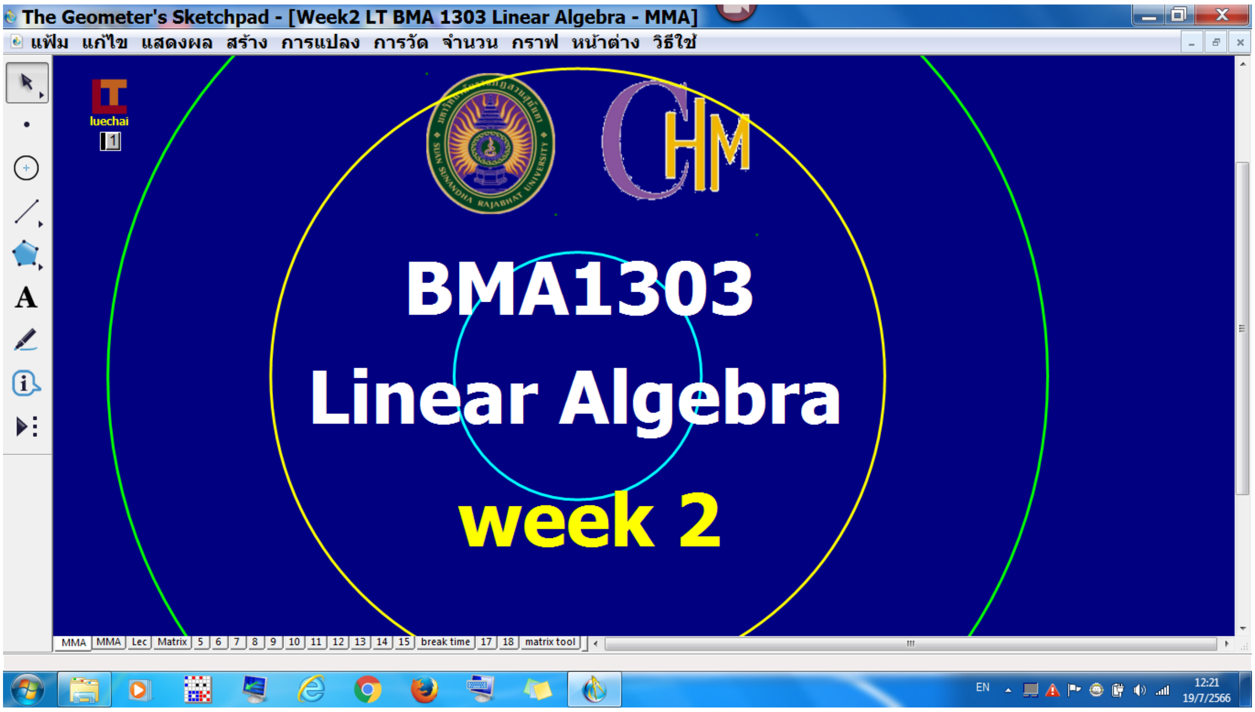
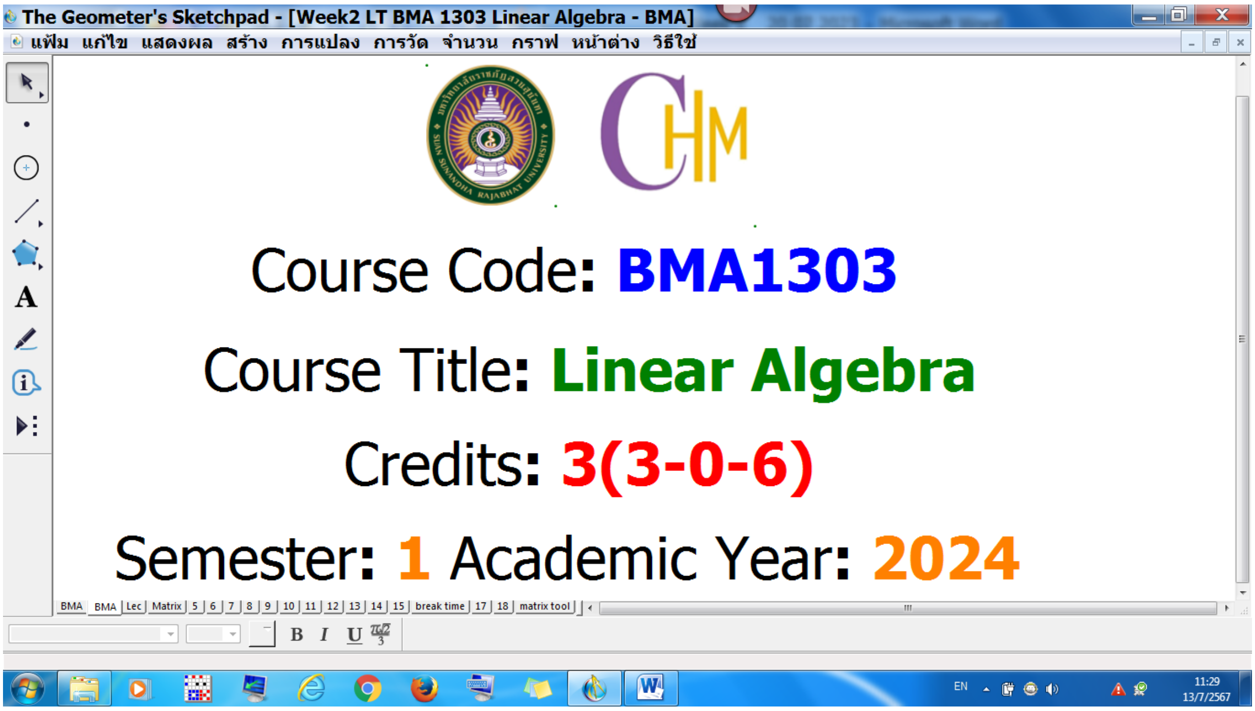
Week 2 (18 July 2024)

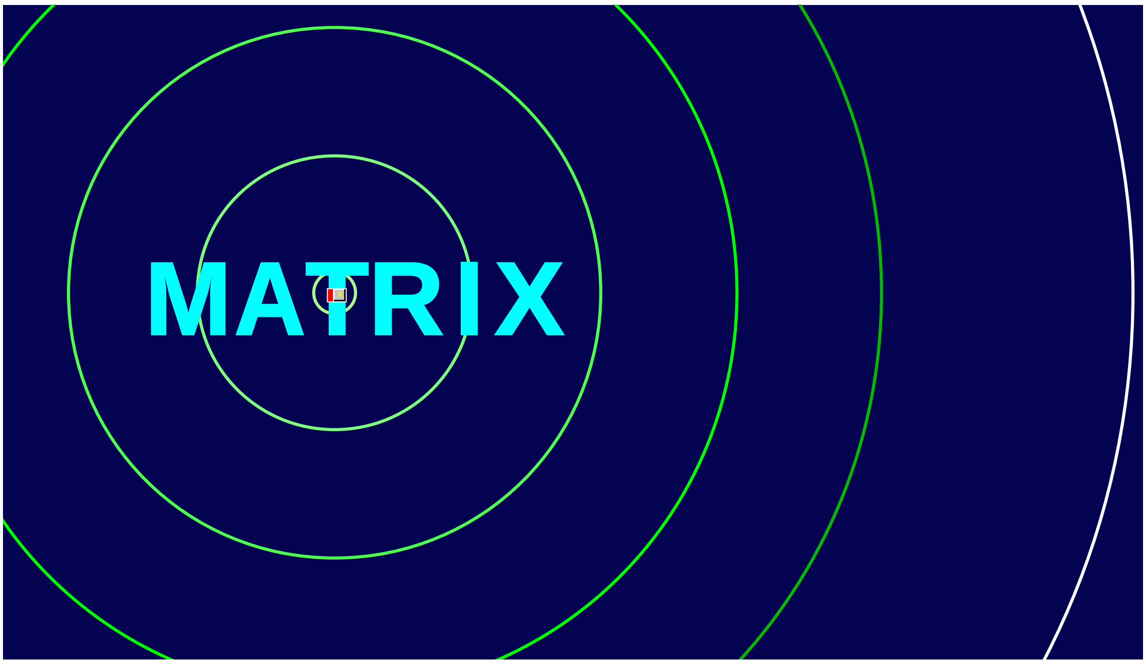




luechai

Lecturer responsible for this course:
Mr.Luechai Tiprungsri

Room Number: **305**
Tel.: **081-972-5793**
Email: **luechai.ti@ssru.ac.th**



Definition of a Matrix

If m and n are positive integers, an mxn matrix (read m by n) is a rectangular array

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ a_{31} & a_{32} & a_{33} & \cdots & a_{3n} \\ \vdots & \vdots & \vdots & a_{ij} & \vdots \\ a_{m1} & a_{m2} & a_{m3} & \cdots & a_{mn} \end{bmatrix}$$

in which each entry, a_{ij}, of the matrix is a number.An mxn matrix has m rows (horizontal lines) and n columns (vertical lines)

aij

We use a capital letter torepesent a matrix. For example

$$A = \begin{bmatrix} -1 & 9 \\ 5 & -2 \end{bmatrix}, \quad B = \begin{bmatrix} \frac{1}{3} \\ 0 \\ \sqrt{2} \end{bmatrix}, \quad C = \begin{bmatrix} 2 & -9 & 0 & 4 \\ -4 & 3 & 5 & -7 \\ 0 & -1 & 7 & 6 \end{bmatrix}$$

Notice that in A, there are 2 rows across and 2 columns down

We say that the order of A is 2x2 or A is a 2x2 matrix.

in B, there are 3 rows across and 1 column down

We say that the order of B is 3x1 or A is a 3x1 matrix.

in C, there are 3 rows across and 4 columns down

We say that the order of C is 3x4 or C is a 3x4 matrix.

read

2 by 2

A
B
C

Some special matrices :

1. **Zero matrix** $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$, $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

2. **Row matrix** $\begin{bmatrix} -1 & 3 & 7 \end{bmatrix}$, $\begin{bmatrix} 3 & 5 & -2 & -8 \end{bmatrix}$

3. **Column matrix** $\begin{bmatrix} \sqrt{2} \\ \frac{1}{7} \end{bmatrix}$, $\begin{bmatrix} 6 \\ 4 \\ -5 \\ 0 \\ -9 \end{bmatrix}$

4. **Square matrix** $\begin{bmatrix} 2 & -7 \\ 0 & 9 \end{bmatrix}$, $\begin{bmatrix} 4 & 3 & -5 \\ 6 & 0 & 1 \\ -9 & 8 & 0 \end{bmatrix}$

5. **Identity marix** $I_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Main diagonal

from upper left to lower right

denoted by " **I** "

1 ex 2 ex 3 ex 4 ex 5 ex 111 main L>R I I2 I3

luechai

exercise

Two matrices are said to be **equal** if they are of the same order and their corresponding elements are equal.

From matrices A, B, C and D : Are there any pairs that are equal ?

$$A = \begin{bmatrix} -2 & \frac{9}{3} & \sqrt{25} \\ 0 & 1 & \pi \end{bmatrix} , \quad B = \begin{bmatrix} \sqrt{4} & 3 & 5 \\ 0 & 1^5 & \pi \end{bmatrix}$$

$$C = \begin{bmatrix} -2 & \sqrt{9} & 5 \\ 0 & 5^0 & \frac{22}{7} \end{bmatrix} , \quad D = \begin{bmatrix} 2 & \frac{6}{2} & \sqrt{(-5)^2} \\ -0 & 0.\dot{9} & \pi \end{bmatrix}$$

luechai

AB Let matrix A **equal to** matrix B ; find x, y, z and w.

$$A = \begin{bmatrix} x+y & -\sqrt{4} \\ w & 4.\dot{9} \end{bmatrix} , \quad B = \begin{bmatrix} \log_2 2 & y \\ \frac{1}{2^{-2}} & w-z \end{bmatrix}$$

Addition, Subtraction, and Scalar Multiplication of Matrices

Matrix addition

A+B If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $B = \begin{bmatrix} e & f \\ g & h \end{bmatrix}$, then $A+B = \begin{bmatrix} a+e & b+f \\ c+g & d+h \end{bmatrix}$

Matrix Subtraction

A-B If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $B = \begin{bmatrix} e & f \\ g & h \end{bmatrix}$, then $A - B = \begin{bmatrix} a-e & b-f \\ c-g & d-h \end{bmatrix}$

Scalar Multiplication

If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then $kA = \begin{bmatrix} ka & kb \\ kc & kd \end{bmatrix}$ where k is a number

Example
ans

If $A = \begin{bmatrix} -4 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -5 \\ -1 & 8 \end{bmatrix}$ find $\frac{1}{5}A - \frac{1}{7}B$

$$\begin{bmatrix} -\frac{4}{5} - \frac{2}{7} & \frac{3}{5} - \frac{(-5)}{7} \\ \frac{1}{5} - \frac{(-1)}{7} & \frac{2}{5} - \frac{8}{7} \end{bmatrix}$$

Multiplication of Matrices

AB

The product of two matrices A and B is defined only when the number of columns in A is equal to the number of rows in B.

Table

Matrices	A	B
Dimensions	m x p	p x n

p

columns in A   rows in B

mxn

The product AB is a matrix of dimension m x n

$$\underset{m \times p}{A} \times \underset{p \times n}{B} = \underset{m \times n}{C}$$

Week 2 (27 August 2021)

luechai

Given $A = \begin{bmatrix} -2 & 3 \\ 5 & -1 \end{bmatrix}$, $B = \begin{bmatrix} -1 & -7 \\ 3 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 3 & 0 & 9 \\ -1 & 5 & -2 \end{bmatrix}$ and $D = \begin{bmatrix} -2 & 1 \\ 7 & -5 \\ 0 & -8 \end{bmatrix}$

find

(a) A x B , B x A

(b) A x C , C x A

(c) B x D , D x B

(d) C x D , D x C

b1

AxC 22 E 23 x =[]

11

-9 12 13

21 22 23

(b) AxC $\quad A_{2x2} \times C_{2x3} = E_{2x3}$

$$\begin{bmatrix} -2 & 3 \\ 5 & -1 \end{bmatrix} \times \begin{bmatrix} 3 & 0 & 9 \\ -1 & 5 & -2 \end{bmatrix} = \begin{bmatrix} (-2)3 + 3(-1) & 15 & -24 \\ 16 & -5 & 47 \end{bmatrix}$$

(b) CxA $\quad C_{2x3} \times A_{2x2}$ cannot be multiplied

b2 CA 23 not