



ALJABAR LINEAR

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Pertemuan 6

Prodi Informatika

Fakultas Teknik

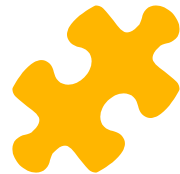
UNIVERSITAS SULAWESI BARAT

Sub-CPMK

Mampu memahami konsep matriks termasuk operasi-operasinya untuk menyelesaikan permasalahan matematik secara efektif dan efisien.

Indikator:

- Ketepatan memahami, menyelesaikan soal tentang kesamaan matriks
- Ketepatan memahami, menyelesaikan soal tentang operasi operasi matriks



Sistem Persamaan Linear

Sebuah garis dalam ruang 2D yang digambarkan dalam sistem koordinat xy dapat ditulis:

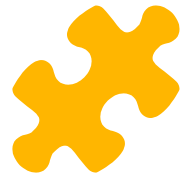
$$ax + by = c \quad (a, b \text{ not both } 0)$$

Dalam ruang 3D:

$$ax + by + cz = d \quad (a, b, c \text{ not all } 0)$$

Dengan menggunakan sebanyak n variabel x_1, x_2, \dots, x_n :

$$a_1x_1 + a_2x_2 + \dots + a_nx_n = b$$



Representasi **SPL**

Representasi Sistem Persamaan Linear menggunakan *Augmented Matrix*

$$x + y + 2z = 9$$

$$2x + 4y - 3z = 1$$

$$3x + 6y - 5z = 0$$



$$\begin{bmatrix} 1 & 1 & 2 & 9 \\ 2 & 4 & -3 & 1 \\ 3 & 6 & -5 & 0 \end{bmatrix}$$

Augmented Matrix




Definisi **Matriks**

DEFINITION 1 A *matrix* is a rectangular array of numbers. The numbers in the array are called the *entries* in the matrix.

Contoh:

| | Mon. | Tues. | Wed. | Thurs. | Fri. | Sat. | Sun. |
|----------|------|-------|------|--------|------|------|------|
| Math | 2 | 3 | 2 | 4 | 1 | 4 | 2 |
| History | 0 | 3 | 1 | 4 | 3 | 2 | 2 |
| Language | 4 | 1 | 3 | 1 | 0 | 0 | 2 |

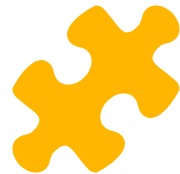

$$\begin{bmatrix} 2 & 3 & 2 & 4 & 1 & 4 & 2 \\ 0 & 3 & 1 & 4 & 3 & 2 & 2 \\ 4 & 1 & 3 & 1 & 0 & 0 & 2 \end{bmatrix}$$



Pemanfaatan **Matriks**

Pemanfaatan matriks antara lain:

- Pada bidang keamanan komputer (Enkripsi data),
- Pemrograman yang membutuhkan array dalam Ilmu Komputer.



Notasi Matriks

- Huruf kapital untuk menotasikan matriks
- Huruf kecil untuk menotasikan kuantitas numerik(skalar) dalam matriks

$$A = \begin{bmatrix} 2 & 1 & 7 \\ 3 & 4 & 2 \end{bmatrix} \text{ or } C = \begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix}$$

- Entry nilai pada baris i dan kolom j matriks dinotasikan dengan a_{ij}

The diagram shows a matrix A with elements $a_{11}, a_{12}, \dots, a_{1j}$ in the first row, $a_{21}, a_{22}, \dots, a_{2j}$ in the second row, and $a_{i1}, a_{i2}, \dots, a_{ij}$ in the i -th row. Arrows point from the rows to labels 'baris 1', 'baris 2', and 'baris i' on the right. Below the matrix, arrows point from the columns to labels 'kolom 1', 'kolom 2', and 'kolom j'.

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1j} \\ a_{21} & a_{22} & \dots & a_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ a_{i1} & a_{i2} & \dots & a_{ij} \end{bmatrix}$$

baris 1
baris 2
baris i

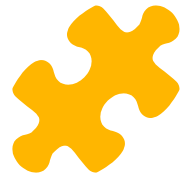
kolom 1 kolom 2 kolom j



Notasi Vektor dalam Matriks

- Notasi vektor menggunakan matriks direpresentasikan menggunakan **huruf kecil** yang **ditebalkan**
- $1 \times n$ vektor baris \mathbf{a} dan $m \times 1$ vektor kolom \mathbf{b} dapat ditulis sebagai berikut:

$$\mathbf{a} = [a_1 \quad a_2 \quad \cdots \quad a_n] \quad \text{and} \quad \mathbf{b} = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_m \end{bmatrix}$$



Notasi Matriks

- Sebuah matriks A dengan baris = kolom = n disebut **square matrix of order n**
- Entry pada $a_{11}, a_{22}, \dots, a_{nn}$ disebut main dari A

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix}$$



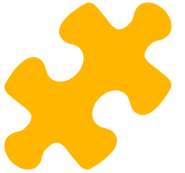
Operasi Matriks

DEFINITION 2 Two matrices are defined to be *equal* if they have the same size and their corresponding entries are equal.

Contoh:

Tentukan manakah matriks yang sama?

$$A = \begin{bmatrix} 2 & 1 \\ 3 & x \end{bmatrix}, \quad B = \begin{bmatrix} 2 & 1 \\ 3 & 5 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 1 & 0 \\ 3 & 4 & 0 \end{bmatrix}$$



Operasi Matriks

DEFINITION 3 If A and B are matrices of the same size, then the *sum* $A + B$ is the matrix obtained by adding the entries of B to the corresponding entries of A , and the *difference* $A - B$ is the matrix obtained by subtracting the entries of B from the corresponding entries of A . Matrices of different sizes cannot be added or subtracted.

Jika matriks A dan B memiliki ukuran yang sama

$$(A + B)_{ij} = (A)_{ij} + (B)_{ij} = a_{ij} + b_{ij} \quad \text{and} \quad (A - B)_{ij} = (A)_{ij} - (B)_{ij} = a_{ij} - b_{ij}$$



Operasi Penjumlahan-Pengurangan Matriks

Contoh: Jika diketahui

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

Tentukan:

1. $A + B$
2. $A - B$
3. $A + C$
4. $B + C$
5. $A - C$
6. $B - C$



Operasi Perkalian Skalar **Matriks**

Contoh: Jika diketahui

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 3 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & 2 & 7 \\ -1 & 3 & -5 \end{bmatrix}, \quad C = \begin{bmatrix} 9 & -6 & 3 \\ 3 & 0 & 12 \end{bmatrix}$$

Tentukan:

1. $2A$
2. $(-1)B$
3. $1/3 C$



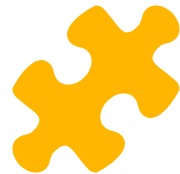
Operasi Perkalian Matriks

Jika diketahui $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 6 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 1 & 4 & 3 \\ 0 & -1 & 3 & 1 \\ 2 & 7 & 5 & 2 \end{bmatrix}$

Maka perkalian matriks A dan B

$$\begin{bmatrix} 1 & 2 & 4 \\ 2 & 6 & 0 \end{bmatrix} \begin{bmatrix} 4 & 1 & 4 & 3 \\ 0 & -1 & 3 & 1 \\ 2 & 7 & 5 & 2 \end{bmatrix} = \begin{bmatrix} \square & \square & \square & \square \\ \square & \square & 26 & \square \end{bmatrix}$$

$$(2 \cdot 4) + (6 \cdot 3) + (0 \cdot 5) = 26$$



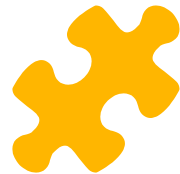
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Maka perkalian matriks A dan B

$$\begin{bmatrix} 1 & 2 & 4 \\ 2 & 6 & 0 \end{bmatrix} \begin{bmatrix} 4 & 1 & 4 & 3 \\ 0 & -1 & 3 & 1 \\ 2 & 7 & 5 & 2 \end{bmatrix} = \begin{bmatrix} \square & \square & \square & 13 \\ \square & \square & \square & \square \end{bmatrix}$$

$$(1 \cdot 3) + (2 \cdot 1) + (4 \cdot 2) = 13$$



Operasi Perkalian Matriks

Jika diketahui $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 6 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 1 & 4 & 3 \\ 0 & -1 & 3 & 1 \\ 2 & 7 & 5 & 2 \end{bmatrix}$

Maka perkalian matriks A dan B

$$(1 \cdot 4) + (2 \cdot 0) + (4 \cdot 2) = 12$$

$$(1 \cdot 1) - (2 \cdot 1) + (4 \cdot 7) = 27$$

$$(1 \cdot 4) + (2 \cdot 3) + (4 \cdot 5) = 30$$

$$(2 \cdot 4) + (6 \cdot 0) + (0 \cdot 2) = 8$$

$$(2 \cdot 1) - (6 \cdot 1) + (0 \cdot 7) = -4$$

$$(2 \cdot 3) + (6 \cdot 1) + (0 \cdot 2) = 12$$

$$AB = \begin{bmatrix} 12 & 27 & 30 & 13 \\ 8 & -4 & 26 & 12 \end{bmatrix}$$



Thanks!

Any questions?

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