

# 3.5 Matrices of Relations, day 1

- Review Exercise # 1-5 all page 172 - Back of Book
- Exercises # 1-15 odd pg 172-173

$$\textcircled{1} \begin{matrix} & \alpha & \beta & \gamma & \delta \\ \begin{matrix} 1 \\ 2 \\ 3 \end{matrix} & \begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 \end{bmatrix} \end{matrix}$$

$$\textcircled{3} \begin{matrix} & a & b & c & d \\ \begin{matrix} x \\ y \\ z \end{matrix} & \begin{bmatrix} 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \end{matrix}$$

$$\textcircled{5} \begin{matrix} & 5 & 3 & 1 & 2 & 4 \\ \begin{matrix} 5 \\ 3 \\ 1 \\ 2 \\ 4 \end{matrix} & \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$\textcircled{7} \textcircled{13} \begin{matrix} & a & b & c & d \\ \begin{matrix} a \\ b \\ c \\ d \end{matrix} & \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$\textcircled{14} \begin{matrix} 1 & 2 \\ 1 & 0 \\ 0 & 1 \end{matrix}$$

$$\textcircled{15} \begin{matrix} 3 & 4 & 5 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{matrix}$$

$$\textcircled{16} \begin{matrix} & a & b & c & d \\ \begin{matrix} a \\ b \\ c \\ d \end{matrix} & \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \end{matrix}$$

$$\textcircled{9} \{ (1,1), (1,3), (2,2), (2,3), (2,4) \}$$

$\textcircled{11}$  when the  $i$   $j$ th entry is 1,  $i \neq j$ , then  $j$   $i$ th entry is not 1.

$\textcircled{13}$  reverse column & row (turn matrix  $90^\circ$ )

$$\textcircled{15} \begin{matrix} & 1 & 2 & 3 & 4 & 5 \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} & \begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

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

NOT TRANSITIVE

$$i, j \neq 0 \Rightarrow i, j \text{ in } A \text{ is } 0$$

$$\textcircled{6} \begin{matrix} & 1 & 2 & 3 & 4 \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

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

when  $i, j \neq 0$  in  $A^2$

$i, j$  are  $\neq 0$  in  $A \therefore$  transitive

$$\textcircled{10} A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

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

when  $i, j \neq 0$  in  $A^2$

$i, j$  are  $\neq 0$  in  $A \therefore$  transitive