C2-001_Practice 02

Date	@2022년 8월 8일 오전 9:30
Lecture Note	C2-001_Lecture_02-matrix.pdf
Practice (pdf)	
Solution (pdf)	
Topics	Lecture 02: Matrix & Linear Transformation I
Week	2

- Please mark what you think is correct answer (O or X) and show why you choose it.

1. The null space of $\mathbf{A} = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 2 & 4 & 6 & 4 \\ 1 & 2 & 0 & -1 \end{bmatrix}$, $N(\mathbf{A})$, is $Span = \left(\begin{bmatrix} -2 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ -1 \\ 1 \end{bmatrix} \right)$.

2. Null space of matrix $\mathbf{A}$, $N(\mathbf{A})$, is not equal to null space of the reduced row-echelon form of $\mathbf{A}$, $N\left(rref\left(\mathbf{A}\right)\right)$.

3. The column space of $\mathbf{A} = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 2 & 4 & 6 & 4 \\ 1 & 2 & 0 & -1 \end{bmatrix}$, $C(\mathbf{A})$, is $Span = \left(\begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 4 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 6 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 4 \\ -1 \end{bmatrix} \right)$.

4. A set of vector $\left\{ \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 4 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 6 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 4 \\ -1 \end{bmatrix} \right\}$ are a basis of the column space of $\mathbf{A}$, $C(\mathbf{A})$.

5. A basis of the column space of $\mathbf{A} = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 2 & 4 & 6 & 4 \\ 1 & 2 & 0 & -1 \end{bmatrix}$ for $C(\mathbf{A})$ is $\left\{ \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 6 \\ 0 \end{bmatrix} \right\}$.

6. If a set of column vectors of matrix $\mathbf{A}$, $\{\mathbf{v}_1, \mathbf{v}_2, \cdots, \mathbf{v}_n\}$, is linearly independent, then the null space of $\mathbf{A}$, $N(\mathbf{A})$, contains only zero vector, $\mathbf{0}$.

7. The number of free variables in $rref(\mathbf{A})$ means the number of row vectos of matrix $\mathbf{A}$.

8. Given $rref(\mathbf{A}) = \begin{bmatrix} 1 & 0 & 0 & -1 & 0 \\ 0 & 1 & 3 & 2 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$, the rank of $\mathbf{A}$, $rank(\mathbf{A})$, is 4.

9. A given transformation, $\mathcal{T} : \mathbb{R}^2 \to \mathbb{R}^3$, $\mathcal{T}\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 - x_2 \\ 3x_2 \\ 2x_1 + x_2 \end{bmatrix}$, this is a linear transformation.

10. The length of unit vector, $\hat{\mathbf{u}}$, is always 1.