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Note: 풀이과정이 없는 답은 0점 처리됨. 간결하고 읽을 수 있도록 정자체로 쓸것.

1. (page 173) 2.7 연습문제 2

$$\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}, \begin{bmatrix} \sqrt{3}/2 & 1/2 & 0 \\ -1/2 & \sqrt{3}/2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

(2,1) 연금 평평이동   원점이 대이 회전.

계산 $\begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{\sqrt{3}}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

답 $= \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} & \frac{2\sqrt{3}+1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} & \frac{\sqrt{3}-2}{2} \\ 0 & 0 & 1 \end{bmatrix}$

2. (page 173) 2.7 연습문제 ⑩

사영행렬, D=차금 평면   ~~정점~~ 정점

$PD = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & -1/10 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 4.2 & 6 & 2 \\ 1.2 & 4 & 6 \\ 4 & 1 & 1 \end{bmatrix}$

$= \begin{bmatrix} 4.2 & 6 & 2 \\ 1.2 & 4 & 2 \\ 0 & 0 & 0 \\ \frac{6}{10} & \frac{8}{10} & \frac{4}{10} \end{bmatrix}$

답 ∴ $\begin{bmatrix} 4.2 & 6 & 2 \\ 1.2 & 4 & 2 \\ 0 & 0 & 0 \\ 0.6 & 0.8 & 0.4 \end{bmatrix}$

1

3. v_1, v_2, v_3, u가 다음과 같을 때, u가 $\{v_1, v_2, v_3\}$에 의해 생성되는 $\mathbb{R}^4$ 부분공간에 속하는지 판단하라.

$$v_1 = \begin{bmatrix} 1 \\ -2 \\ 4 \\ 3 \end{bmatrix}, \quad v_2 = \begin{bmatrix} 4 \\ -7 \\ 9 \\ 7 \end{bmatrix}, \quad v_3 = \begin{bmatrix} 5 \\ -8 \\ 6 \\ 5 \end{bmatrix}, \quad u = \begin{bmatrix} -4 \\ 10 \\ -7 \\ -5 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 4 & 5 & -4 \\ -2 & -7 & -8 & 10 \\ 4 & 9 & 6 & -7 \\ 3 & 7 & 5 & -5 \end{bmatrix}$$

$$\sim \begin{bmatrix} 1 & 4 & 5 & -4 \\ 0 & 1 & 2 & 2 \\ 0 & -7 & -14 & 9 \\ 0 & -5 & -10 & 7 \end{bmatrix}$$

∴ 속하지 않음

$$\sim \begin{bmatrix} 1 & 4 & 5 & -4 \\ 0 & 1 & 2 & 2 \\ 0 & 0 & 0 & 23 \\ 0 & 0 & 0 & 17 \end{bmatrix} \longrightarrow 해들가지X$$

4. (page 182) 2.8 연습문제 13

$$A = \begin{bmatrix} 3 & -6 & 9 & 0 \\ 2 & -4 & 7 & 2 \\ 3 & -6 & 6 & -6 \end{bmatrix} \sim \begin{bmatrix} ① & -2 & 5 & 4 \\ 0 & 0 & ③ & 6 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

↓ 초초에   ↓ 초초에

$$\begin{bmatrix} 1 & -2 & 5 & 4 & 0 \\ 0 & 0 & 3 & 6 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} = [A \; 0]$$

$x_1 - 2x_2 + 5x_3 + 4x_4 = 0$

$3x_3 + 6x_4 = 0$

$\begin{cases} x_1 = 2x_2 - 5x_3 - 4x_4 = 0. \\ x_3 = -2x_4 \\ x_2, x_4 \text{ 는 자유변수} \end{cases}$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = x_1 \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \\ 0 \\ 0 \end{bmatrix} x_2 + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} x_3 + \begin{bmatrix} 0 \\ 0 \\ -2 \\ 1 \end{bmatrix} x_4$$

$$= \begin{bmatrix} 2 \\ 1 \\ 0 \\ 0 \end{bmatrix} x_2 + \begin{bmatrix} -5 \\ 0 \\ 0 \\ 0 \end{bmatrix} x_3 + \begin{bmatrix} -4 \\ 0 \\ -2 \\ 1 \end{bmatrix} x_4$$

↑ u   ↑ v   ↑ w

이 $\{u, v, w\} = $ 는 $Nul A$의 기저이다.

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

족축 열 $\longrightarrow$ ∴ $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ $\begin{bmatrix} 5 \\ 3 \\ 0 \end{bmatrix}$ 은 $Col A$의 기저근이른다.

$$Col A = \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 5 \\ 3 \\ 0 \end{bmatrix} \right\}$$

5. (page 189) 2.9 연습문제 4

~~$X = a\begin{bmatrix}3\\0\end{bmatrix} + b\begin{bmatrix}\\\end{bmatrix}$~~

$X = a\begin{bmatrix}3\\0\end{bmatrix} + b\begin{bmatrix}-1\\2\end{bmatrix}$

$\langle X \rangle_B = \begin{bmatrix}a\\b\end{bmatrix}$ 일때

$= \begin{bmatrix}3a-b\\2b\end{bmatrix}$

$3a-b=4$
$2b=1$

$b=0.5$
$a=1.5$

$[X]_B = \begin{bmatrix}1.5\\0.5\end{bmatrix}$

$[W]_B = \begin{bmatrix}x\\y\end{bmatrix}_B$

~~$\frac{3}{2}, 2b$~~

$3x-y=1$
$2y=-2$

$x=3$
$b=-1$

$[W]_B = \begin{bmatrix}3\\-1\end{bmatrix}$

~~문제에서 b_1, b_2 $\varnothing \rho_3$ 만든다는 평면이고 $\frac{1}{2}x+y = \frac{3}{2}$~~

$1.5 b_1 + 0.5 b_2 = 1.5\begin{bmatrix}3\\0\end{bmatrix} + 0.5\begin{bmatrix}-1\\2\end{bmatrix}$

$= \begin{bmatrix}4\\1\end{bmatrix} = X$ 계산결과와 일치)

6. (page 189) 2.9 연습문제 7

$$A = \begin{bmatrix} 1 & -3 & 2 & -4 \\ 3 & -9 & -1 & 5 \\ -3 & -6 & 4 & -3 \\ -4 & 12 & 2 & 7 \end{bmatrix} \text{이라이라}$$

$$\sim \begin{bmatrix} 1 & -3 & 2 & -4 \\ 0 & 0 & \textcircled{0} & 5 & -7 \\ 0 & 0 & 0 & 5 \\ 0 & 0 & 8 & -9 \\ & & 10 \end{bmatrix}$$

$$\sim \begin{bmatrix} \textcircled{1} & -3 & 2 & -4 \\ 0 & 0 & \textcircled{5} & -7 \\ 0 & 0 & 0 & 5 \\ 0 & 0 & \textcircled{5} & 5 \end{bmatrix} \quad \sim \begin{bmatrix} 1 & -3 & 2 & -4 \\ 0 & 0 & 5 & -7 \\ 0 & 0 & 0 & 5 \\ 0 & 0 & 0 & 5 \end{bmatrix} \Rightarrow \cancel{\#}$$

$$\longrightarrow \text{주축열}.$$

Nul A 를구하자

$$\begin{bmatrix} 1 & -3 & 2 & -4 & 0 \\ 0 & 0 & 5 & -7 & 0 \\ 0 & 0 & 0 & 5 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 1 & -3 & 2 & -4 & 0 \\ 0 & 0 & 5 & -7 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 1 & -3 & 2 & 0 & 0 \\ 0 & 0 & 5 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \sim \begin{bmatrix} 1 & -3 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}^{3}$$

$$\begin{cases} x_1 = 3x_2 \\ x_3 = 0 \\ x_4 = 0. \quad x_2 \text{ 자유변수} \end{cases}$$

$$X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = x_2 \begin{bmatrix} 3 \\ 1 \\ 0 \\ 0 \end{bmatrix}$$

$\therefore$ 기저는 $\begin{bmatrix} 3 \\ 1 \\ 0 \\ 0 \end{bmatrix}$ 이됨, $\qquad \therefore$ Nul$A = \begin{bmatrix} 3 \\ 0 \end{bmatrix}$

$\therefore$ 부분공간이 1개인 Nul$A$ 를 가진다, 즉, Nul$A$의 차원은 1 이다,

$\frac{1}{3}$ 차원이다, $\qquad \dim H = 1$