UAS ALIN 2019/2020 by Udin (Maaf kalau salah)

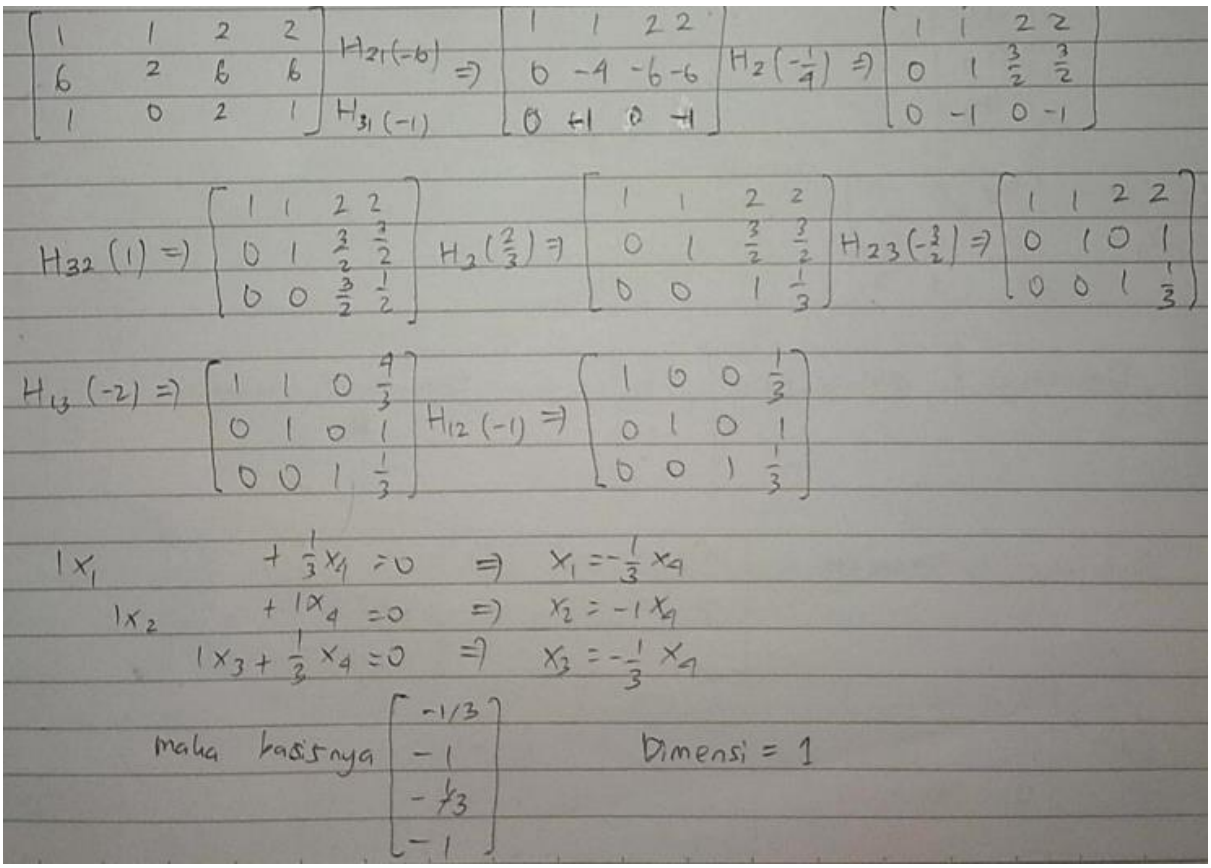
1) Himpunan Vektor A: {(2,1,4),(1,2,1),(5,4,9)}
   Himpunan Vektor B: {(5,1,3),(2,0,1),(2,2,5)}

$$A = \begin{bmatrix} 2 & 1 & 5 & 2 & 1 \\ 1 & 2 & 4 & 1 & 2 \\ 4 & 1 & 9 & 4 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 5 & 2 & 2 & 5 & 2 \\ 1 & 0 & 2 & 1 & 0 \\ 3 & 1 & 5 & 3 & 1 \end{bmatrix}$$

detA = 36+16+5 - (40+8+9) — detB = 0+12+2 - (0+10+10)
detA = 0 — detB = -6
Himpunan vektor A — Himpunan vektor B
Linear independen (detA=0) — Linear dependen (bukan 0)

2)
$$x_1 + x_2 + 2x_3 + 2x_4 = 0$$
$$6x_1 + 2x_2 + 6x_3 + 6x_4 = 0$$
$$x_1 + 0x_2 + 2x_3 + x_4 = 0$$

$$\begin{bmatrix} 1 & 1 & 2 & 2 \\ 6 & 2 & 6 & 6 \\ 1 & 0 & 2 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = 0$$



3) $u_1 = (1,2,3)$
   $u_2 = (1,0,1)$
   $u_3 = (2,1,2)$

$u = v$

$$\mathbf{u_1} = \mathbf{v_1} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \qquad \mathbf{u_2} = \mathbf{v_2} - \frac{\mathbf{u_1} \cdot \mathbf{v_2}}{\mathbf{u_1} \cdot \mathbf{u_1}} \mathbf{u_1} = \begin{bmatrix} \frac{5}{7} \\ -\frac{4}{7} \\ \frac{1}{7} \end{bmatrix}$$

$$\mathbf{e_1} = \frac{\mathbf{u_1}}{\sqrt{\mathbf{u_1} \cdot \mathbf{u_1}}} = \begin{bmatrix} \frac{\sqrt{14}}{14} \\ \frac{\sqrt{14}}{7} \\ \frac{3\sqrt{14}}{14} \end{bmatrix} \qquad \mathbf{e_2} = \frac{\mathbf{u_2}}{\sqrt{\mathbf{u_2} \cdot \mathbf{u_2}}} = \begin{bmatrix} \frac{5\sqrt{42}}{42} \\ -\frac{2\sqrt{42}}{21} \\ \frac{\sqrt{42}}{42} \end{bmatrix}$$

$$\mathbf{u_3} = \mathbf{v_3} - \frac{\mathbf{u_1} \cdot \mathbf{v_3}}{\mathbf{u_1} \cdot \mathbf{u_1}} \mathbf{u_1} - \frac{\mathbf{u_2} \cdot \mathbf{v_3}}{\mathbf{u_2} \cdot \mathbf{u_2}} \mathbf{u_2} = \begin{bmatrix} \frac{1}{3} \\ \frac{1}{3} \\ -\frac{1}{3} \end{bmatrix}$$

$$\mathbf{e_3} = \frac{\mathbf{u_3}}{\sqrt{\mathbf{u_3} \cdot \mathbf{u_3}}} = \begin{bmatrix} \frac{\sqrt{3}}{3} \\ \frac{\sqrt{3}}{3} \\ -\frac{\sqrt{3}}{3} \end{bmatrix}$$

$$\mathbf{e_1} = \begin{bmatrix} \frac{\sqrt{14}}{14} \\ \frac{\sqrt{14}}{7} \\ \frac{3\sqrt{14}}{14} \end{bmatrix}, \mathbf{e_2} = \begin{bmatrix} \frac{5\sqrt{42}}{42} \\ -\frac{2\sqrt{42}}{21} \\ \frac{\sqrt{42}}{42} \end{bmatrix}, \mathbf{e_3} = \begin{bmatrix} \frac{\sqrt{3}}{3} \\ \frac{\sqrt{3}}{3} \\ -\frac{\sqrt{3}}{3} \end{bmatrix}$$

4) $A = \begin{bmatrix} 2 & 0 & 0 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

$$\begin{vmatrix} 2-\lambda & 0 & 0 \\ 5 & 1-\lambda & 0 \\ 0 & 1 & 3-\lambda \end{vmatrix} = -\lambda^3 + 6\lambda^2 - 11\lambda + 6$$

$\lambda_1 = 2;$ $\lambda_2 = 1;$ $\lambda; = 3$

Eigenvalue: 2, **eigenvector:** $\begin{bmatrix} -\frac{1}{5} \\ -1 \\ 1 \end{bmatrix} = \begin{bmatrix} -0.2 \\ -1 \\ 1 \end{bmatrix}$

Eigenvalue: 1, **eigenvector:** $\begin{bmatrix} 0 \\ -2 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ -2 \\ 1 \end{bmatrix}$

Eigenvalue: 3, **eigenvector:** $\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$

5) $u = \begin{bmatrix} x \\ y \end{bmatrix}$ Rotasi $30\circ$

$$T = \begin{bmatrix} \cos 30\circ & -\sin 30\circ \\ \sin 30\circ & \cos 30\circ \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

$$T = \begin{bmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

Pencerminan

$$T = \begin{bmatrix} \frac{\sqrt{3}}{2}x & -\frac{1}{2}y \\ \frac{1}{2}x & \frac{\sqrt{3}}{2}y \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$$

Proyeksi orthogonal thd sumbu y

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

Maka $T = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$