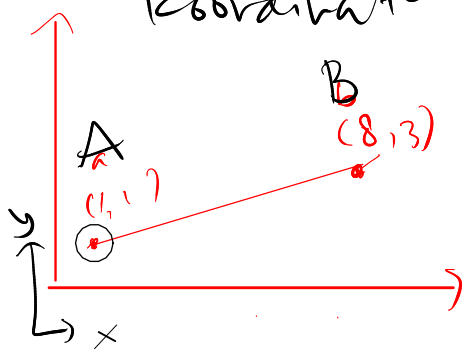
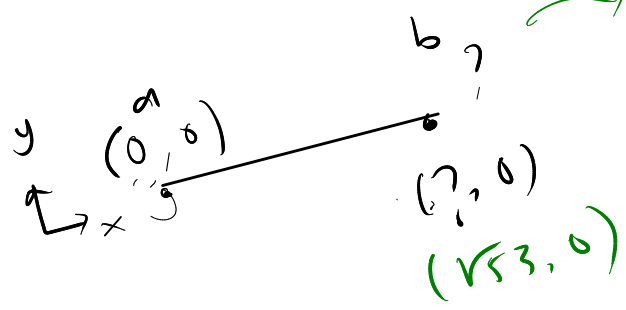
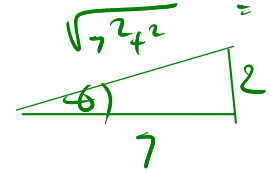
Global koordinat- → Lokal koordinate







$\cos\theta = \frac{7}{\sqrt{53}}$

$\sin\theta = \frac{2}{\sqrt{53}}$

Pergeseran

$(1,1) \Rightarrow (0,0)$

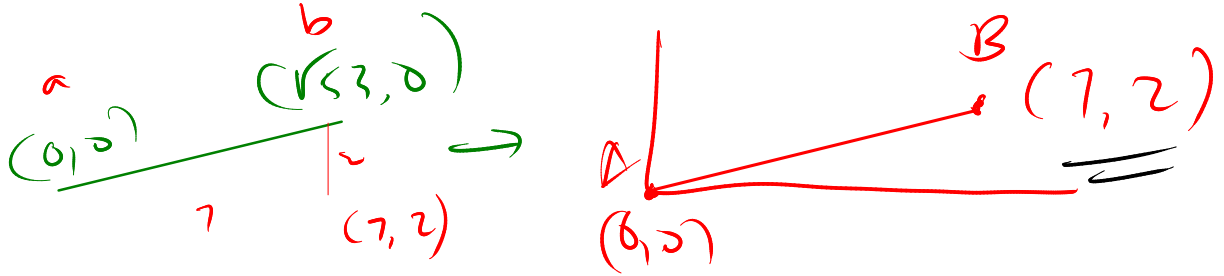
$\begin{bmatrix} 0 \\ 0 \end{bmatrix} - \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \\ -1 \end{bmatrix}$

$\begin{bmatrix} A \\ B \end{bmatrix} \rightarrow \begin{bmatrix} a \\ b \end{bmatrix} \Rightarrow \begin{bmatrix} \cos & \sin \\ -\sin & \cos \end{bmatrix} \begin{bmatrix} a+p \\ b+p \end{bmatrix}$

$B \rightarrow \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} 8-1 \\ 3-1 \end{bmatrix} = \begin{bmatrix} 7/\sqrt{53} & 2/\sqrt{53} \\ -2/\sqrt{53} & 7/\sqrt{53} \end{bmatrix} \begin{bmatrix} 7 \\ 2 \end{bmatrix}$

$= \begin{bmatrix} 49/\sqrt{53} + 4/\sqrt{53} \\ -14/\sqrt{53} + 14/\sqrt{53} \end{bmatrix} = \begin{bmatrix} 53/\sqrt{53} \\ 0 \end{bmatrix} = \begin{bmatrix} \sqrt{53} \\ 0 \end{bmatrix}$

Lokal → Global



$\sin\theta = 2/\sqrt{53}$

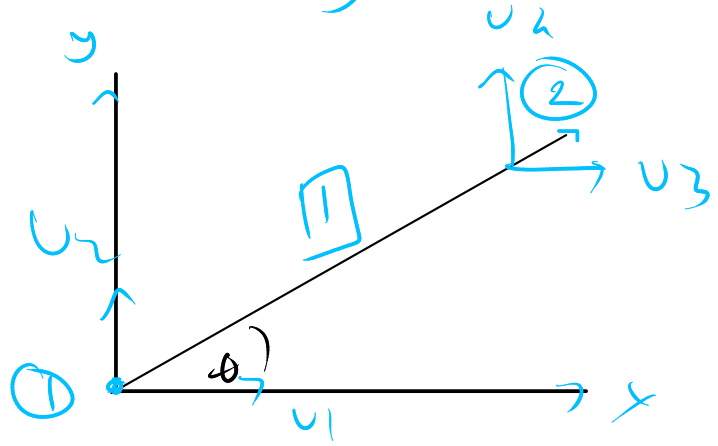
$\cos\theta = 7/\sqrt{53}$

Lokal ↓

$$KLG = \begin{bmatrix} \cos & -\sin \\ \sin & \cos \end{bmatrix} \begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 7/\sqrt{53} & -2/\sqrt{53} \\ 2/\sqrt{53} & 7/\sqrt{53} \end{bmatrix} \begin{bmatrix} \sqrt{53} \\ 0 \end{bmatrix}$$

$$= \begin{bmatrix} 7 \\ 2 \end{bmatrix}$$

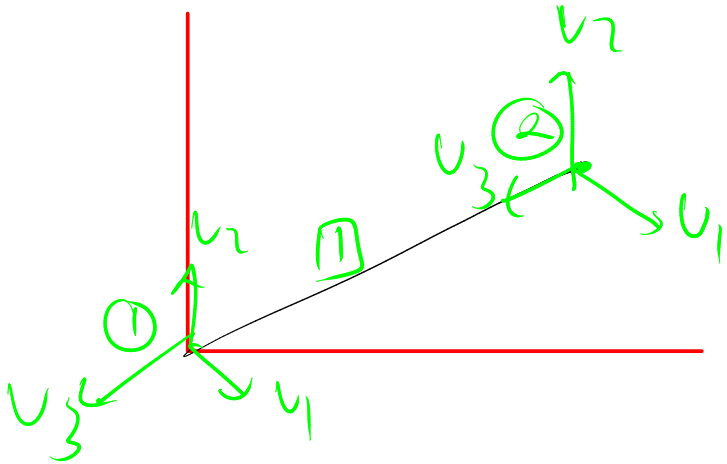
2-D



elemen 1 → [1, 2, 3, 4]

$$[K^{(e)}] = [R]^T \begin{bmatrix} k_e & -k_e \\ -k_e & k_e \end{bmatrix} [R]$$

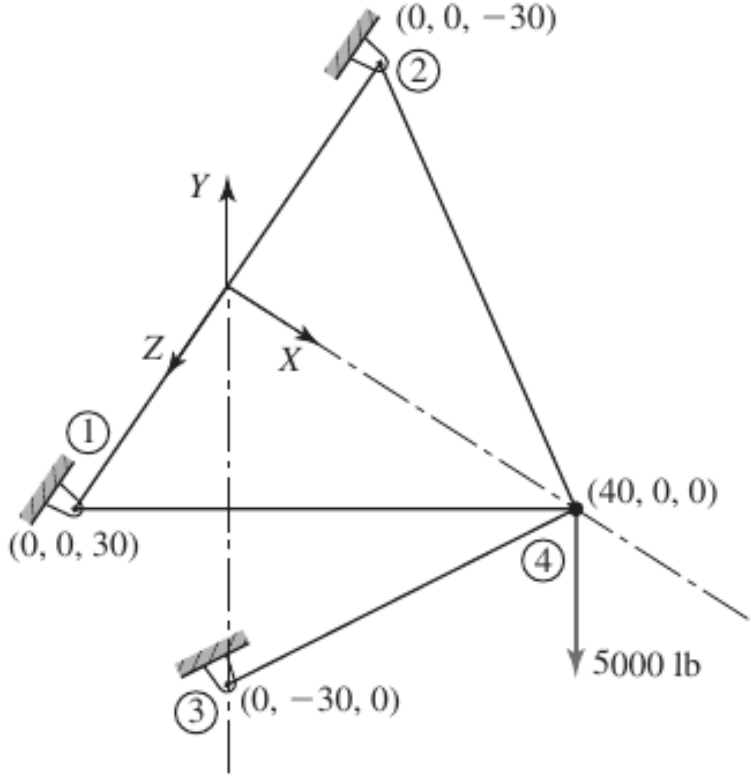
3D



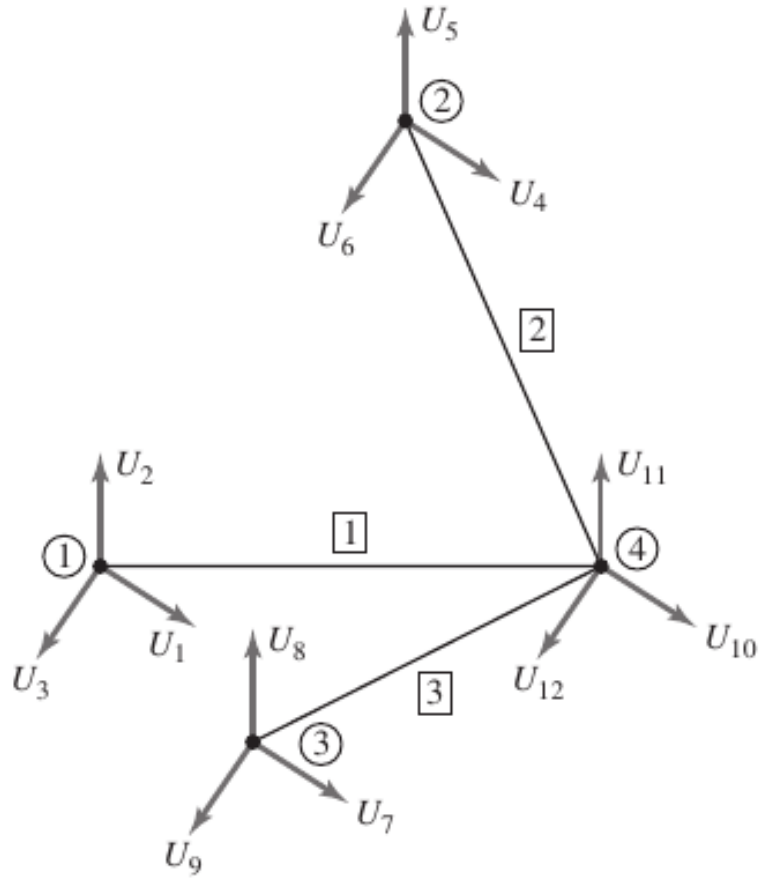
1 → [1, 2, 3, 4, 5, 6]

2D → R^T = $\begin{bmatrix} \sin & 0 \\ \cos & 0 \\ 0 & \cos \\ 0 & \sin \end{bmatrix}$

3D → R^T = $\begin{bmatrix} \cos x & 0 \\ \cos y & 0 \\ \cos z & 0 \\ 0 & \cos x \\ 0 & \cos y \\ 0 & \cos z \end{bmatrix}$

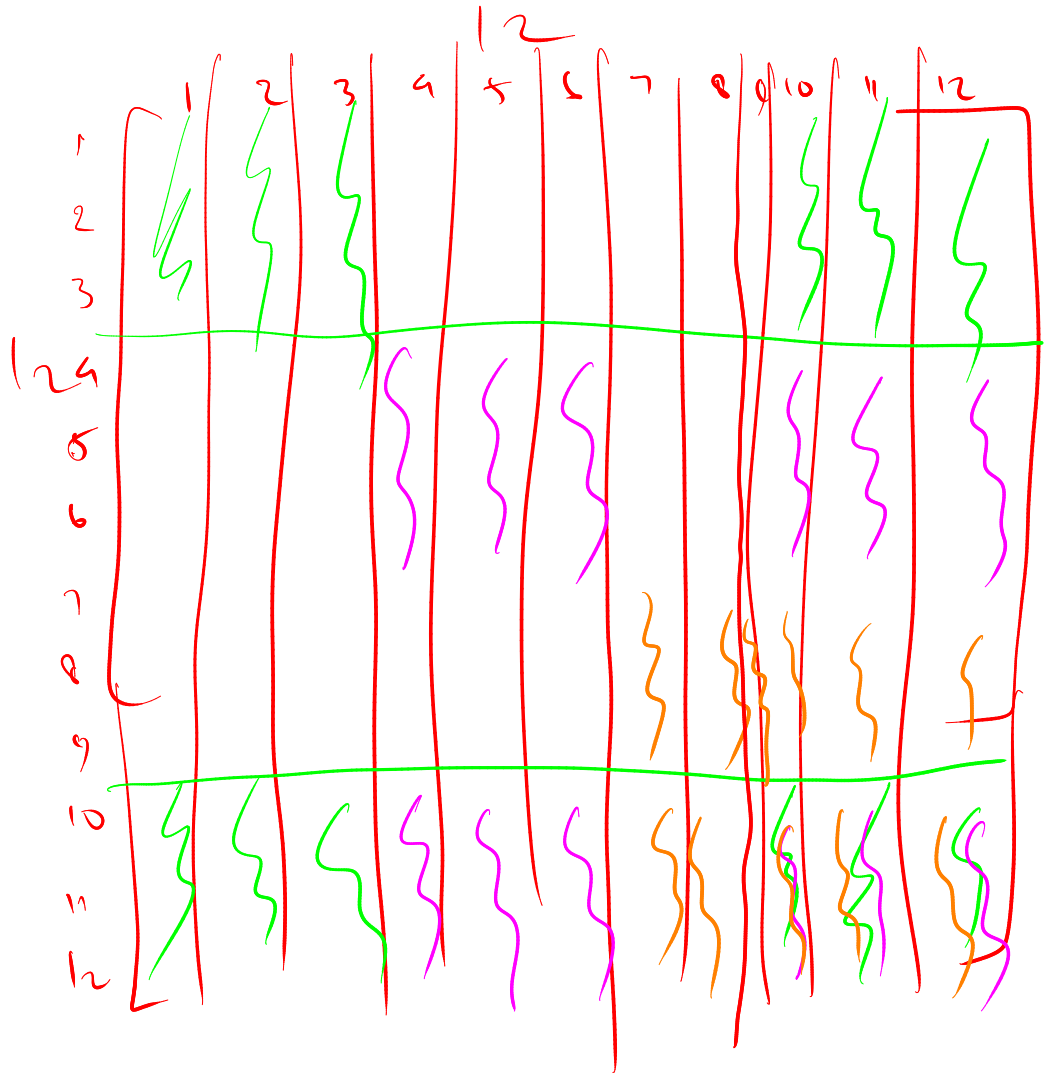

(0, 0, −30)
2
Y
Z
X
1
(0, 0, 30)
(40, 0, 0)
4
5000 lb
3
(0, −30, 0)

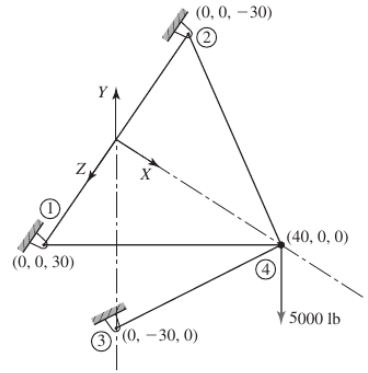
(a)

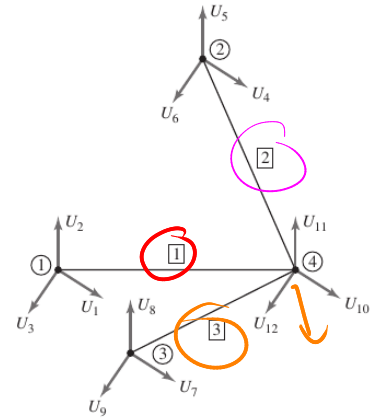

U5
2
U4
U6
2
U2
U11
1
1
4
U1
U8
U10
U3
3
U12
3
U7
U9

(b)

$$\left[K^{(e)}\right] = k_e \begin{bmatrix} c_x^2 & c_x c_y & c_x c_z & -c_x^2 & -c_x c_y & -c_x c_z \\ c_x c_y & c_y^2 & c_y c_z & -c_x c_x & -c_y^2 & -c_y c_z \\ c_x c_z & c_y c_z & c_z^2 & -c_x c_z & -c_y c_z & -c_z^2 \\ -c_x^2 & -c_x c_x & -c_x c_z & c_x^2 & c_x c_y & c_x c_z \\ -c_x c_y & -c_y^2 & -c_y c_z & c_x c_y & c_y^2 & c_y c_z \\ -c_x c_z & -c_y c_z & -c_z^2 & c_x c_z & c_y c_z & c_z^2 \end{bmatrix}$$




(0, 0, −30)
Y
Z
X
(0, 0, 30)
(40, 0, 0)
5000 lb
(0, −30, 0)
(a)


U_5
U_6
U_4
U_2
U_{11}
U_1
U_3
U_8
U_{12}
U_{10}
U_7
U_9
(b)

$[k]\{u\} = \{f\}$


U_{10}